MANITOBA'S NORTHLAND

INCLUDING

HUDSON BAY REGION

AND

RICE LAKE GOLD AREA

MINERALS

PULP WOOD

WATER POWERS

FISH AND FURS

AGRICULTURE

NOVEMBER, 1918

ISSUED BY AUTHORITY PROVINCE OF MANITOBA

J. A. CAMPBELL
Commissioner of Northern Manitoba
The Pas, Man.

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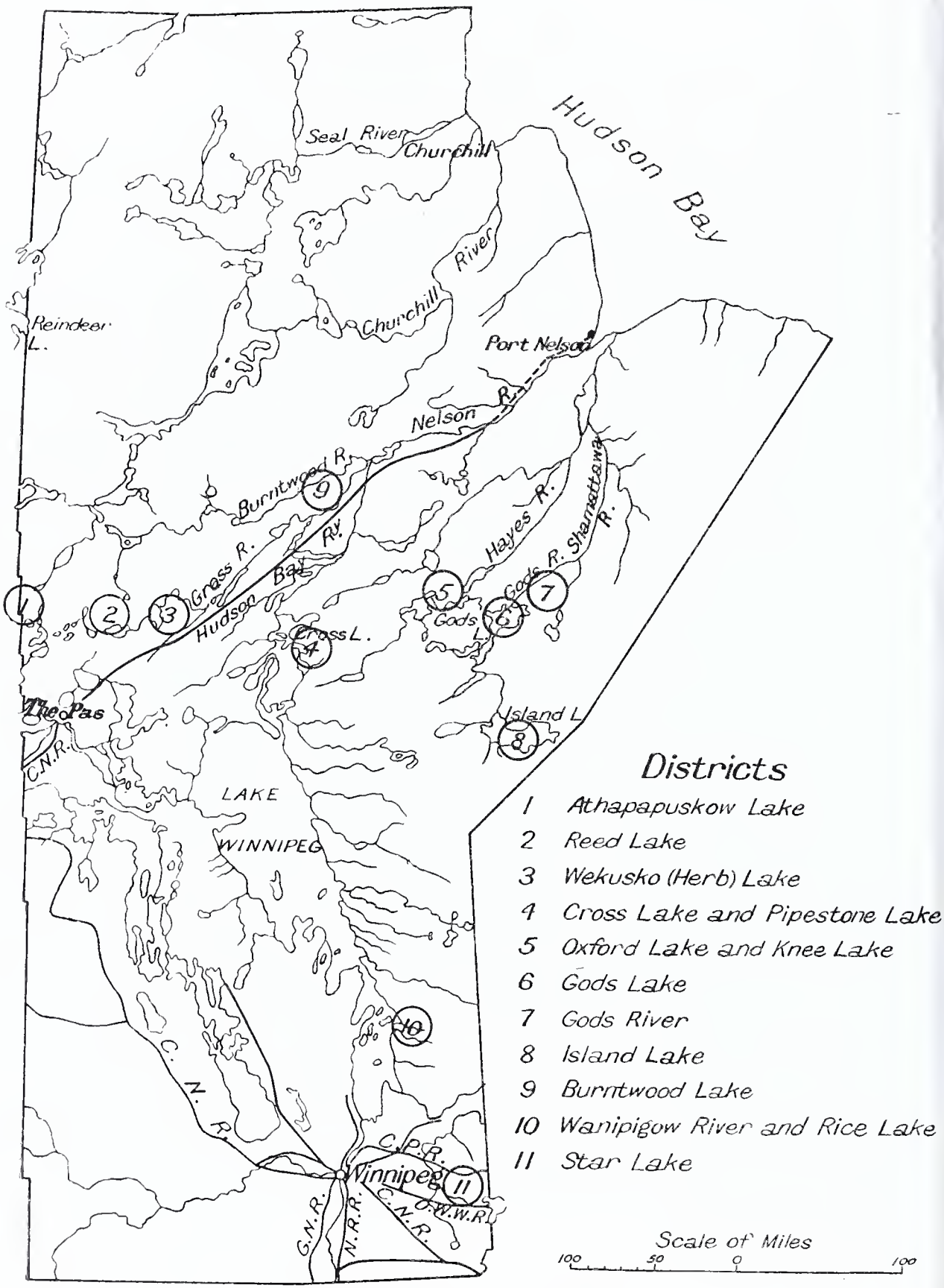
Fort Prince of Wales, exterior view. (*Top*)
Ruins of Fort Prince of Wales and Entrance to Churchill Harbor. (*Centre*)
Fort Prince of Wales, Gateway. (*Bottom*)

Foreword

In November, 1917, the illustrated booklet "Northern Manitoba" was issued under the direction of the Commissioner of Northern Manitoba. The original intention had been to give to the public authentic information regarding the mineral discoveries north of The Pas but it was finally decided to enlarge the scope of the publication and give in brief form as complete as possible a description of the whole of the new territory added to the province when the boundaries of Manitoba were extended in the year 1912, with a summary of its known resources. The booklet, therefore, treated of mining, timber and pulp wood, water powers, fish and furs, agricultural possibilities and a comprehensive article on the Hudson Bay route.

Two large editions of "Northern Manitoba" were printed, but the demand for copies has been so great that the supply is exhausted. Instead of issuing a third edition it has been thought advisable to collate the material for a completely new publication which brings news of development in the mineral areas up to date and also offers some hitherto unavailable information regarding other features of Manitoba's Northland.

This publication goes to the press on the eve of a change in the Commissionership of Northern Manitoba. Mr. J. A. Campbell, M.P., who has discharged the duties of the Commissionership since it was inaugurated in 1916, has resigned owing to the requirements of parliamentary duties and is to be succeeded on December 1st, 1918, by Robert C. Wallace, former Professor of Geology and Mineralogy in the University of Manitoba.



Known Mineral Areas of Manitoba

Prospecting Areas in Manitoba

Dr. E. L. Bruce

(By permission of the Geological Survey Branch, Dominion Department of Mines)

General Statement

The extension of the boundaries of Manitoba northward and north-eastward, to include the southern part of the old district of Keewatin, added to the Province a great area of country not particularly suitable for agriculture. Much of the newly acquired territory lies within the borders of the Canadian shield of pre-Cambrian rocks, and except where locally mantled by lake clays is rocky and rather barren. Along the valleys of Grass and Burntwood Rivers there is good clay land that will in time probably support agricultural settlements, but any great development of the major portion of this new part of the Province must depend on resources other than the soil. The fur trade is the oldest industry of the district, the furs in the early days being taken out to Nelson and Churchill until the encroachment of the traders from the south diverted a large part of the output for a time to the St. Lawrence. With the establishment of inland posts by the Hudson's Bay Company, and the amalgamation of the North West Company with its older rival, trade again shifted to the northern route. Now, however, that the southern part of the district is connected by rail with the eastern markets, practically all of the furs are taken out by that means. The value of the trade is still large. During the past few years the southern part of the new area has produced a considerable amount of merchantable timber. In the northern part of the Province much of the timber is small and will never be the basis of any large industry. If protected from fire it should be quite sufficient for local needs.

Since the Hudson's Bay Railway has reached the lake country lying north of Saskatchewan River some of the larger lakes have produced quantities of fish. The varieties marketed include sturgeon, lake trout, whitefish and pickerel. Pike are found in these lakes in larger numbers than any of the three other varieties, but at present they are not shipped. There seems to be no reason for this except prejudice. With proper regulation and the prevention of fishing during the spawning season this should be a stable industry.

Fur, timber and fish have already added considerably to the output of the Province, but the northern district has one asset as yet entirely undeveloped. On many of the larger streams there are water-powers that require only a market for power to make them extremely valuable. Grand Rapids, at the mouth of the Saskatchewan River, is estimated to be capable of producing at least 35,000 horsepower, and there are falls with even greater possibilities on Churchill and Nelson Rivers. There should be no difficulty in electrifying the Hudson Bay Railway.

Although the value of these resources should not be minimized, it is to the development of a mineral industry that Manitoba must look if the newly acquired territory is to be of great importance. Mining would not only furnish a local market for the other resources, especially the yet undeveloped water powers, but would create a market for commodities not produced locally. It is unfortunate that since the administration of public lands is under Federal control the Province has not appropriated as large sums to the improvement of transportation as it might otherwise have done. The value even of a prospective mining industry to the business interests of the Province is quite independent of the governmental control of public lands, and the opening up on undeveloped areas so that they can be more easily reached by prospectors is a direct benefit to business in the distributing centres. In spite of the difficulties that must be met in establishing a new mining field, important amounts of copper ore are now being produced from the area north of The Pas in the western part of Manitoba, and as actual mining in this one locality will have a stimulating effect on prospecting in other promising areas, it is the purpose of this article to summarize the information concerning them, now scattered through various publications.

In the better known parts of the Canadian shield, basic rocks, sediments or volcanics, intruded by granite, have been found to be favorable for ore deposits. Including the older part of the Province there are known to be eleven principal areas of such rocks in Manitoba.

The districts where these are found are:

1. Athapapuskow Lake.
2. Reed Lake.
3. Wekusko (Herb) Lake.
4. Cross Lake and Pipestone Lake.
5. Oxford Lake and Knee Lake.
6. Gods Lake.
7. Gods River.
8. Island Lake.
9. Burntwood River.
10. Wanipigow River and Manigotagan River, east of Lake Winnipeg.
11. Star Lake.

Athapapuskow Lake

An area of basic pre-Cambrian rocks lies north of Lake Athapapuskow, and extends westward across the western boundary of the Province. The high grade chalcopyrite deposit now being worked by the Mandy Mining Company is in this area. Owing to the economic importance of this body of ore the geology of the district has been more thoroughly worked out than that of most other areas, and a brief summary of the rock relations will be given to show the association of the ores.

General Geology—The oldest formation is a complex of volcanic flows, pyroclastic and ash rocks, altered to greenstone and schist. These are similar to the Keewatin of Ontario, and the Lake Superior country, but as they are so far removed from areas of rocks known to be of that age, the term Keewatin should not be applied to them. Northward the greenstone belt is bounded by a great area of gneissic rocks, partly sediments now recrystal-

Mandy Mining Company's Plant at Schist Lake, showing Power House, Head Frame, Barges, Etc.

lized, and partly granite intruded as sills and bosses. The gneisses seem to be conformably above the greenstones, which grade up into them, and seem, in places, to be interlayered with the gneissoid rocks. A series of rocks undoubtedly sedimentary in origin, consisting of conglomerate, arkose and greywacke, overlies the greenstone in closely compressed northwesterly pitching synclines or forms small infaulted blocks in the greenstone series. The sediments are clearly unconformable upon the greenstone, pebbles of which are found in the conglomerate, but their relation to the gneisses is not known. The composition of

the arkose is such that extreme metamorphism might recrystallize it into gneissic rocks. not unlike the sedimentary members of the gneissic complex just referred to.

Igneous intrusions are represented by a few small basic dykes, the largest seen being that which crosses the south-east bay of Flinflon Lake, and by batholiths of granite porphyry, gneissoid and massive granites. A short distance north-east of the producing area a boss of granite porphyry with a surface extent of about 3 square miles intrudes the green-

5000 tons Pure Chalcopyrite from Mandy Mine in dump at foot of Schist Lake to be hauled out by teams next winter. Another barge load just coming in.

stone. Pebbles of granite porphyry of very similar appearance and fragments of quartz with the same peculiar bluish color, characteristic of the quartz of this batholith, occur in the greywacke and conglomerate, and hence this rock is believed to be earlier than the sediments. Most of the other granitic intrusives are certainly later than the sediments, and are the latest pre-Cambrian rocks, even the gneissoid varieties having undergone practically no deformation since the time of their intrusion.

Following the solidification of the granite there was a long period during which the mountains formed at the time of the granite invasion were slowly worn down to a surface much like that of the present pre-Cambrian. Finally the whole of this part of Manitoba was covered by the shallow seas of the Palaeozoic; and upon the pre-Cambrian, flat-lying dolomites were deposited. Part of these were later eroded and the old complex again exposed. During the Pleistocene period the greater part of the Athapapuskow Lake district was undergoing removal of the weathered debris that lay upon the solid rocks Locally in sheltered places there was some accumulation of glacial material, and in the district to the south-east thick deposits of stratified clays were laid down in the waters of Lake Agassiz, along the front of the retreating ice lobes. In recent times undrained areas and the valley bottoms have been filled with an accumulation of peat, which interferes rather seriously with prospecting for bodies of easily eroded ores.

Ore Deposits—The bodies of mineral now being developed in the Lake Athapapuskow district are complex mixtures of sulphides consisting of pyrite, pyrrhotite, chalcopyrite and zinc blende, with small amounts of gold and silver. They occur in folded and sheared volcanic rocks (now altered to schist and greenstone) not far from the outcrops of massive granite with which the ores are believed to be genetically connected. Two periods of mineralization have been recognized. The deposition of pyrite or pyrrhotite in favorable zones was followed by a slight movement, which fractured the original sulphides and made way for the introduction of chalcopyrite and zinc blende. These minerals filled the openings produced by the movement, and replaced the pyrite and pyrrhotite, as well as come country rock. Sulphides of both these periods carry gold and silver, but in neither are the values sufficiently high to make the lenses workable for precious metals alone. Only those bodies

are valuable in which there has been enough chalcopyrite or zinc blende deposited during the second mineralization to constitute ores of those metals.

Reed Lake District

The district lying north of Reed Lake is in reality the eastward extension of the Athapapuskow Lake district, but it is nearly cut off from it by granite, and has received much less attention from prospectors. The southern shore of the lake is formed by an escarpment of Palaeozoic dolomite, the northern shore, except at the outlet of the lake, by basic volcanic rocks similar to those already described. The eastern bay, from which the Grass River flows, is in granite. How far inland the volcanics of the north shore extend is not yet known, but the map of the Churchill-Nelson basins shows them as far north as File and Loonhead Lakes, a distance of about 15 miles. The descriptions of the rocks in the vicinity of File Lake, however, show that they are not typical greenstone and schist, but rather are similar to the sedimentary gneisses previously referred to. Following the analogy of other large lakes of this area, it does not seem likely that the volcanic rocks occupy more than a comparatively narrow margin along the lake. No discoveries of valuable minerals have yet been reported from the Reed Lake district, but traces of copper have been observed in the vicinity of File Lake.*

Wekusko Lake District

The Wekusko Lake district is the eastern end of the belt of basic pre-Cambrian rocks that, although constructed at various places, is practically continuous from Athapapuskow Lake. During the summer of 1914 following the gold excitement at Beaver Lake in Saskatchewan at the western end of the belt, prospectors working westward from the Hudson Bay Railway, made the first discoveries of gold quartz veins at Wekusko.

The geological sequence is somewhat similar to that at Athapapuskow, but there are many acidic flows associated with the conglomerates, and staurolitic and cyanitic schists are interbedded with conglomerate and with sedimentary gneisses. The intrusive rocks, diorite, granodiorite and granite, are on the whole more basic than are those of the western district. Glacial Lake Agassiz covered this region, and a thick mantle of lake clays now conceals much of the solid rock.

The veins occur in all varieties of rocks earlier than the intrusives, but they are larger and more regular in the brittle volcanic rocks than in the soft, staurolitic schists. They are of the usual lenticular type characteristic of pre-Cambrian gold veins. The minerals besides quartz are tourmaline, a little pyrite and chalcopyrite, arsenopyrite, gold and a gold telluride.

Cross Lake and Pipestone Lake District

The trough of basic rocks at Cross Lake and Pipestone Lake consists of chlorite schist, hornblende schist, diorite, rusty gneisses and schistose conglomerate, containing pebbles of granite and diorite. The schistose complex is intruded by granite and granite gneiss, and by dark grey gabbro dykes along the margin of which some deposits of pyrite and chalcopyrite have been found. Quartz veins carrying some arsenopyrite, and molybdenite, have been found on Echimamish River in rocks, which may belong to an extension of the Cross Lake trough.

Oxford and Knee Lake District

The rocks in the vicinity of Oxford and Knee Lakes seem to be much like those just described at Cross and Pipestone Lakes. They are classified as hornblende and mica schists, associated with grey gneiss, diorite and schistose conglomerate, in which are pebbles of syenite and grey quartzite. Quartzite bands are also mentioned in the report on the district. These rocks are intruded by a coarse light-colored granite. Magnetite has been noted on the south side of the inlet of Knee Lake, and interlayered with quartzite and mica schist on Magnetite Island in the narrows of the 'ake.

* Summ. Report, 1906, p. 95.

Gods Lake District

The part of Manitoba lying along the new Manitoba-Ontario boundary line is drained by Gods River to Shamattawa River. This district is less accessible from Lake Winnipeg than the district farther west, and so has not received much attention. The description of A. S. Cochrane's exploration of Gods Lake mentions the occurrence of mica, hornblende and diorite schists, massive diorite, and "compact dark greenish-grey diorite with small quartzite pebbles." This is probably a greywacke, the matrix of which has been derived from dioritic rocks, and which has been reconstituted into a rock much like the original. Sediments of that kind are found in the Athapapuskow Lake district. The relation of these to the gneissic rocks called Laurentian is not definitely stated in the report, nor is any mention made of intrusives.

Island Lake District

Island Lake lies south of Gods Lake, very close to the interprovincial boundary. Information concerning this region is as scanty as that for Gods Lake. The rocks noted by

Ross Navigation Company's Boat and Barge, with 150 tons Copper Ore on way from Sturgeon Landing to The Pas.

Cochrane are "dark grey felsitic schist—glossy calcareous schist, siliceous slate, and felsitic slate of an olive grey color." Steatitic schist, hornblende slates and shistose conglomerate are also reported, but without any detailed description or statement of the relations of the various types. Serpentine is said to occur on Iron Island.

Gods River District

A small area of schistose conglomerate occurs on Gods River, about halfway from Gods Lake to the Shamattawa River. It overlies the syenite gneiss, and is cut by basic intrusives.

Burntwood River District

Pipe Lake, just south of Burntwood River, lies in a small trough of fine-grained, green schist, striking north 55 degrees east and dipping steeply. Tongues of dioritic schists extend to the Burntwood from the southwest at a point 2 miles below Minago Falls, and a very small area of basic rocks is shown on map 58A, Geological Survey of Canada, on Kiwanzi brook, which enters Burntwood River from the south, just at the outlet of Burntwood Lake.

District East of Lake Winnipeg

An area lying east of Lake Winnipeg in the basins of Manigotagan and Wanipigow Rivers has attracted considerable attention on account of the samples carrying large amounts of gold brought from that district. However, no regular production has yet been estab-

lished. The district is rather difficult of access, as both rivers are poor canoe routes, and no summer roads exist.

The pre-Cambrian rocks with which the veins are associated have been arranged provisionally as follows:

Manigotagan granite, pegmatite and gneiss.

Intrusive contact—

Wanipigow series: mica schists and gneisses.

Rice Lake series: porphyry-andesite and greenstone.

The Rice Lake series consists chiefly of feldspar: porphyry, quartz, porphyry, andesite and greenstone; the Wanipigow series of quartz, feldspar schists or gneisses in places garnetiferous. Apparently they are foliated arkoses or greywacke. The gold occurs in quartz veins in shear zones usually in andesite or porphyry. The amount of metallic mineral is small, those other than the gold being principally pyrite and chalcopyrite.

Star Lake District

Star Lake is in the extreme south-eastern corner of Manitoba, south of the Canadian Pacific Railway. The district was prospected during the period of development of the gold veins, in the vicinity of the Lake of the Woods, and some work has been going on from that time to the present. Much money has been spent and dozens of shafts sunk in the district, but practically all the claims are now abandoned. Recently there has been a revival of interest in the district on account of the discovery of molybdenite.

The oldest rocks are schists and ellipsoidal weathering greenstone, with which are involved some areas of sedimentary rocks, which have never yet been separately mapped. Both sediments and volcanics are intruded by a fresh reddish to grey granite gneiss, which is the country rock, both to the north-west and south-east of the narrow belt of basic rocks between West Hawk and Falcon Lakes.

Narrow shear zones in the greenstone are impregnated with quartz, which carries pyrite and arsenopyrite with some gold. Samples collected by J. R. Marshall from some of the old pits carry appreciable amounts of platinum. Molybdenite occurs in pegmatite dykes, which cut the greenstone near the contact with the granite gneiss. The dykes varying up to 10 feet in width are approximately parallel to the contact, and though not continuous form, north of Falcon Lake, a zone about 2 miles in length. They consist mostly of pink weathering feldspar, and have muscovite and molybdenite as common constituents, with beryl more rarely, and occasionally native bismuth.

The molybdenite is found in the following physical relations:

1. As a constituent of typical pegmatite dykes.
2. In equigranular granitic dykes.
3. In quartz veins related to the pegmatites.

In the typical pegmatite dykes the molybdenite forms crystals from a fraction of an inch up to 2 inches in diameter, the size seeming to increase, but the number of crystals to decrease as the granite gneiss is approached. The equigranular dykes carry crystals approximately equal in size to the quartz and feldspar, and the whole being of medium texture, such a dyke has a granitic appearance. In quartz veins molybdenite flakes are found in veinlets traversing the quartz. The veins are closely related to typical pegmatites, and the molybdenite-bearing stringers seem to be tiny pegmatites made up largely of molybdenite, with very narrow borders of feldspar. They do not seem to be secondary.

Future of These Districts

The foregoing brief summary of available information with reference to areas of promising formations in Manitoba is a basis for looking forward to the establishment of at least a few mining camps, when conditions become more favorable. In the Athapapuskow Lake district, since the larger rivers and lakes lie in the depressions eroded in the basic rocks, the promising formations occupy only comparatively narrow margins along the main waterways, and their area is much smaller than the early surveys indicated. However, there are

large sections not yet thoroughly prospected, and as sulphide lenses, because they are easily eroded, would occupy the hollows, and so be hidden beneath recent deposits, it does not seem probable that all of the valuable ores have already been located. Careful and thorough work will be necessary, but the success of the early locators augurs well for the future of this district. Little attention has been given to quartz veins since the discovery of the sulphide bodies, but some of them are undoubtedly gold-bearing; and should future development of the sulphide ores lead to the erection of a smelter in the district, even low grade gold-bearing quartz would be valuable for flux.

Conditions at Reed Lake and at Wekusko Lake are much the same. At Reed Lake but little prospecting has been done, and the country is practically unknown. At Wekusko Lake, although quartz veins withstand weathering, and are not so likely to be in the hollows, as are the sulphide lens that are the chief object of search further west, the mantle of clay is a serious handicap. However, the proximity of this district to present transportation facilities will make it possible to work fairly low grade material.

Many of the other areas north of Saskatchewan River are so little known that nothing definite can be said concerning their possibilities, but the types of rocks reported seem to warrant exploration in those regions as soon as possible. Some of them could be easily reached from the Hudson Bay Railway, but unfortunately the line lies too far to the south-east to serve the most promising areas without the construction of branch lines. In the event of discovery of valuable minerals in any of the districts listed there would be no greater difficulties to overcome than are at present being successfully met in the Athapapuskow Lake district by the Mandy Mining Company, but only high grade ore could be mined without railway connections, and large bodies of low grade mineral would be unworkable.

The district east of Lake Winnipeg is handicapped by lack of even good canoe routes. Some of the veins have exceedingly rich pockets in them, but apparently the values are very irregularly distributed. It is probable that some of the deposits can be worked with inexpensive equipment, but so far as known at present the installation of large plants would not be justified, and would certainly have a bad effect on the future of the district.

The south-eastern corner of Manitoba is easily accessible since it is crossed by several railway lines. The failure of the early attempts at gold mining in the Star Lake district may have been, to some extent, due to poor management, and modern methods might make some of the veins workable. The molybdenite deposits are low grade, but without a mill test on a large sample, the value cannot be even approximately given. The ease with which the dykes containing the mineral could be mined, and the accessibility of the deposits, should make it possible to determine this without much expense. This district, even though it has already been rather thoroughly prospected, under present conditions, merits re-examination.

The following is a partial list of the reports and articles that deal with the various districts:

Athapapuskow Lake, Reed Lake, Wekusko Lake Districts

Bruce, E. L.....Amisk Lake district: Summ. Rept., 1914, Geol. Surv., Can., pp. 91-94.
A new gold area in northern Saskatchewan and Manitoba: Can. Mining Inst. Trans., vol. xviii, pp. 174-181.
Amisk-Athapapuskow Lake area: Summ. Rept., 1915, Geol. Surv., Can., pp. 126-130.
Schist Lake and Wekusko Lake areas: Summ. Rept., 1916, Geol. Surv., Can., pp. 159-169 (2 maps).
Map No. 1692, Geol. Surv., Can., Preliminary map Amisk-Athapapuskow Lakes.
Metal mining in Manitoba in 1917: Can. Min. Jour., Dec. 15th, 1917, p. 476.
Mining in northern Manitoba: Bull. Can. Min. Inst., March, 1918.

Callinan, J. W....Flinflon Lake copper district: Eng. and Ming. Jour., Feb. 17, 1917, p. 303.

Campbell, J. A....Manitoba and Mining Province, May 1917, Northern Manitoba, Nov., 1917. And other pamphlets from the office of the Commissioner of northern Manitoba.

DeLury, J. S.....The mineral belt of The Pas, Manitoba: Can. Ming. Jour., vol. xxxvii, No. 17, pp. 412-414.

Dowling, D. B ...Ann. Rept. Geol. Surv., Can., 1900, part FF.

McInnes, W .....Summ. Rept., Geol. Surv., Can., 1910, pp. 169-173. Basins of Nelson and Churchill Rivers; Mem. 30, Geol. Surv., Can. (map).

Tyrrell, J. B .....Ann. Rept., Geol. Surv., Can., 1900, part F.

Wallace, R. C .....Sulphide deposits of Flinflon and Schist Lakes, Man.: Can. Min. Jour., vol. xxxvii, p. 468.

Manitoba gold belt prospects: Eng. and Ming. Jour., vol. 102, p. 332.

Mining situation in Manitoba during 1916: Bull. Can. Min. Inst., January, 1917.

Mining situation in Manitoba during 1917: Bull. Can. Min. Inst., January, 1918.

Mining Developments in Manitoba: Eng. and Ming. Jour., vol. 102, p. 80.

Wallace, R. C.....and DeLury, J. S.—The mineral belt of The Pas, north-western Manitoba and eastern Saskatchewan: Can. Min. Inst., Bull. 44, Oct., 1916, p. 884.

Rice Lake District. Mineral belt north of The Pas. Star Lake in eastern Manitoba: Manitoba Public Utilities Commission Report.

Burntwood River, Cross Lake and Pipestone Lake Districts

Bell, R.....Report of Progress, Geol. Surv., Can., 1877-78, part CC.

Tyrrell, J. B.....Ann. Rept. Geol. Surv., Can., 1900, part F.

McInnes, W.....Basins of Churchill and Nelson Rivers: Mem. 30, Geol. Surv., Can.

Oxford and Knee Lakes, Gods Lake, Island Lake and Gods River Districts

Bell, R.....Rept. of Prog., Geol. Surv., Can., 1877-78, part CC, p. 21.

Rept. of Prog., Geol. Surv., Can., 1878-79, part C.

Dobbs, S.....Summ. Rept. Geol. Surv., Can., 1905, p. 73.

District East of Lake Winnipeg

Dresser, J. A.....Gold-bearing district of south-eastern Manitoba: Summ. Rept., Geol. Surv., Can., 1916, p. 169 (1 map).

Harding, W. K....Field for the prospector in Manitoba: Min. and Eng. World, May 27, 1916, pp. 993-99 6.

Moore, E. S.....Region east of the south end of Lake Winnipeg: Summ. Rept., Geol. Surv., Can., 1912, p. 262 (1 map).

Tyrrell, J. B.....and Dowling, D. B—East shore of Lake Winnipeg: Ann. Rept., Geol Surv., Can., 1898, part G.

Wallace, R. C.....and DeLury, J. S.—Rice Lake district, etc., Man. Pub. Util. Comm. Rept.

Star Lake District

DeLury, J. S .....Molybdenite at Falcon Lake, Man.: Can. Min. Jour., Dec. 1, 1917, p. 460.

Parsons, A. L.... Rept. Bur. of Mines, Ont., 1912, p. 201.

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The Northern Manitoba Mineral Belt

(Report of J. A. Campbell, Commissioner of Northern Manitoba)

"Northern Manitoba" is now beginning to have a really definite meaning to the people of Canada as a vast territory of immense possibilities, just in the initial stages of its development. What has already taken place in the way of development is merely a minute indication of what may be counted on in the future. This Northern Hinterland having an area of 178,000 square miles was added to Manitoba in 1912, thus putting that province on an even footing, as to extent, with the other Western provinces, and only the future will show whether this equality holds good in other respects.

This extension of territory means much to Manitoba. Hitherto the most inland, it is now to be reckoned with as one of the Maritime provinces; and the province which has given its name to the best wheat in the world, and which heretofore has been looked upon as devoted almost exclusively to the production of that wheat, must henceforth take an important place amongst the mineral producing areas in Canada, particularly in the output of copper and gold.

This country, which is looked upon and spoken of as "Hinterland," is really at the front of the province, for it was by way of Hudson Bay, through this region, that the first settlers came to the Red River valley in 1812. Before many more years have passed the wheat and farm products of the successors of these pioneers will pass out through the gateway by which they came. This means of export (and of import also) is the Hudson Bay Railway, extending from The Pas to Port Nelson, and now almost completed.

Among other benefits, the construction of this road is directing the attention of the people to Northern Manitoba. It has become known that this immense area is not a vast stretch of rock, water and muskeg which has been the general opinion regarding it hitherto, but that there exist there natural resources of great richness and variety. While investigation as yet has been only of the most general nature, it has shown the existence of hundreds of thousands of acres of good agricultural land, great stretches of valuable pulp wood, a vast network of lakes and rivers abounding in fish of the finest quality, and an unknown area, hitherto merely scratched, in which there have been made discoveries of mineral wealth of such promise as to put Manitoba on the map as a mineral producer.

Mineral Area

Until very recently the known mineral area has been practically confined to that lake and river district stretching from Lake Athapapuskow and the Saskatchewan boundary on the west to Wekusko or Herb Lake on the east, a distance of approximately one hundred miles. This, roughly speaking, forms the base of an inverted triangle, the apex of which is The Pas, the westerly side being the Saskatchewan River and connecting lakes, and the easterly side the Hundson Bay Railway.

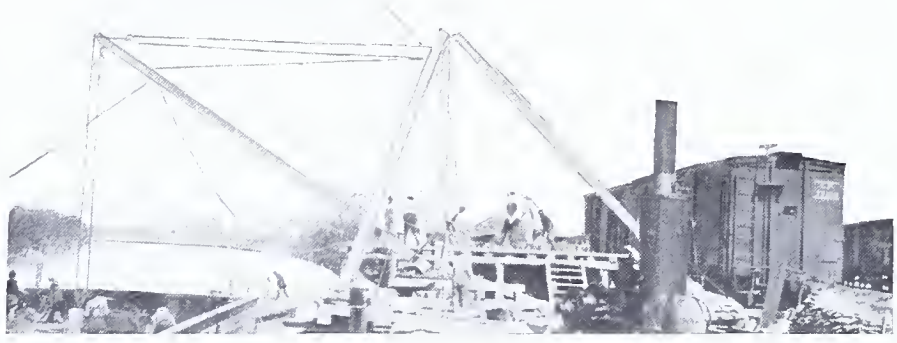
Lake Athapapuskow is reached by Ross Navigation Company steamers, which give regular summer service from The Pas to Sturgeon Landing via the Saskatchewan River, Cumberland and Sturgeon (or Namew) Lakes. From Sturgeon Landing to Lake Athapapuskow, a distance of sixteen miles, a road has been constructed by the Manitoba Government which is of very material benefit for the hauling of machinery, supplies and other freight. There is an alternative canoe route here, via Sturgeon and Goose Rivers and Goose Lake, connecting with the terminus of the government road at Lake Athapapuskow, by a three mile portage.

The other end of the district at Herb Lake is still more easily reached. This is by the Hudson Bay Railway from The Pas to Mile 82. From there a government road, locally known as the "Gordon Highway" runs to McKay's Landing at the south end of the lake, a distance of eleven miles. Mining properties already discovered commence at a point about five miles north of this landing, and run to the northern end of the lake.

As might naturally be expected, mineral discoveries in this district were first made at each end of the mineral area, as being most readily accessible, and these also are the points where active development work and mining operations are now being carried on.

The Great Sulphide Property—Flin Flon Lake

It is less than three years ago—August, 1915—since this great body of ore was located and thus was demonstrated the fact that copper must henceforth be taken into consideration as one of the important mineral resources of the North. Thomas Creighton, was the original discoverer. He was one of a group of six prospectors sent out to prospect in that district by certain Toronto capitalists and mining men known as the Hammill-Currie-Fasken Syndicate. Ten claims were staked and steps taken immediately to find out the quality and extent of the ore body. By stripping and trenching it was learned that it is approximately 2,000 feet long. The body is narrowest at the north and widest at the south end where it enters the lake, being there about 300 feet wide, a vast deposit of solid sulphide. Sampling and re-sampling indicated that at normal values the ore would



Transferring Ore at The Pas from barge to cars for shipment to Trail Smelter.

realize about $10.00 to the ton in gold, copper and silver, the copper content averaging $1\frac{1}{4}$ per cent.

This discovery attracted wide attention and during the succeeding two years prominent capitalists engaged in mining operations, and mining engineers from New York, Boston, San Francisco, as well as from Eastern Canada, visited the property. Various propositions were submitted to the original owners who held out for a figure and terms which were thought to be somewhat excessive and onerous for a new property, thus no sale outright has yet been made, although others have become interested in the property and it is now in the control of a syndicate which includes these along with most of the original owners, which syndicate is under the management of David Fasken and John H. Black, of Toronto, well known in connection with various Northern Ontario enterprises.

A few months after the discovery a contract was let for diamond drilling this property. A complete drilling outfit, supplies and equipment were taken in during the winter and camp established on the lake shore. On March 26th, 1916, two drills were started on the work and continued until July 15th, 1916. Further contracts were let subsequently and these drills have been almost constantly employed for a period of nearly two years. $200,000.00 has been spent in this and other work of investigation in the same connection.

But this big expenditure has been amply justified. Investigation has borne out the original estimate, and the drilling done has resulted in proving up the stupendous quantity of over 20,000,000 tons of sulphide ore which will yield an average of from $8.00 to $10.00 per ton, at normal prices.

This proven tonnage has satisfied the owners that development work and actual mining operations should be proceeded with. To do this properly means the erection of a

smelter at the mine or at some place convenient thereto, also the construction of a railway from The Pas, a distance of about eighty miles. Whatever it might be possible to do at the present time regarding the smelter, war conditions have now made it out of the question to construct the railway. Reports from reliable sources indicate that it is absolutely impossible to obtain the necessary steel.

To properly work and operate this property along the lines indicated means that an important camp of at least 3,500 people will be established there, and a tremendous impetus given to the northern mining industry generally. The construction and operation of the works required will also result in the development of other properties in the district, which the owners are not now able to handle properly owing to the great cost involved, but which properties can, when transportation facilities are afforded and a smelter located at an available point, be operated to advantage. Here is an immense enterprise, the development of which can be confidently looked forward to immediately on the conclusion of the war.

Mandy Mine—Schist Lake

In all the history of mining there is probably on record no enterprise more unique than that carried on by the Mandy Mining Company at Schist Lake. The truth of this statement is readily conceded when it becomes known that this company after mining the ore haul it about forty miles by teams, then ship it 125 miles by boat and barge to The Pas, and from there by rail to a smelter at Trail, B.C., half way across the continent. It is handled in the process six or seven times. Only marvellously rich ore and a large quantity of it could stand such expense.

In October, 1915, after the Flin Flon discovery had become known, Mr. F. C. Jackson a sub-contractor on the Hudson Bay Railway, and Mr. S. S. Reynolds, a prospector of some experience, started out from The Pas to see the North country and do some prospecting. By a lucky chance they discovered on the shore of Schist Lake at a spot where many others had been before, a deposit of copper sulphide, which has since proven to be so valuable. Mr. J. E. Spurr, vice-president of the Tonopah Mining Company, was in the district at the time, inspected the claims staked, was immediately impressed with their possibilities, and before he left an agreement was entered into by which the Tonopah Mining Company took over the property and agreed to develop and operate it. A subsidiary company called the Mandy Mining Company was immediately formed for this purpose, and the following summer $40,000 was spent in diamond drilling, trenching and other preliminary work. This revealed a body of over 100,000 tons in one lens. Careful assays of the ore showed it to be composed mainly of copper and zinc, the former averaging about 20 per cent., and in addition to this there was found to be gold and silver values of approximately $5.00 a ton.

With the price of copper soaring skyward owing to the great demand brought about by the war, it was in order to put this mine in the producing class at the earliest possible moment. This decision was arrived at in the latter part of December, 1916, and contract was let by Mr. H. C. Carlisle, superintendent for the company, for the hauling of 3,000 tons or more to the head of navigation at Sturgeon Landing, almost forty miles distant. Commendable enterprise was shown by the contractor, C. B. Morgan, in starting and pushing forward the work and by the spring break-up 3,335 tons had been deposited at the Landing, with the exception of a small amount which had been teamed all the way to The Pas. The ore was simply taken out of an open cut, the only machinery used being a couple of steam drills, and a horse derrick. During the summer of 1917 this ore was shipped to the smelter and the returns therefrom were 337 ounces gold, 60 ounces silver and 1,113,935 pounds of copper, the total tonnage therefor averaging 17 per cent. copper.

During the summer months complete new mining equipment which had been taken in during the preceding winter was installed in a large frame building. The main shaft was sunk to 200-foot level, and two drifts started in the ore body. Drifting was continued throughout last winter, and it is now extended 534 feet. Also the company purchased or built, and put in operation during the summer a 52-foot tug on Lake Athapapuskow, and a small stern wheel steamer on Schist Lake, together with a number of large barges. By

this means a quantity of ore was transported part of the distance by water, thus lessening the winter team haul to a very considerable extent.

Last winter (1917-'18) a contract was let to the same contractor for taking out a minimum of 7,500 tons, and when the season closed 8,600 tons were in the dump at Sturgeon Landing. This is now being hauled out as rapidly as possible by the Ross Navigation Company steamers and shipped to Trail. A spur track has been put in by the Canadian Northern Railway at The Pas, connecting the main line with the dock, in this way facilitating very materially the work of trans-shipment. Further effort is being made to reduce the labor and expense incident to this work, and to increase the annual output so it is expected that next winter a still greater tonnage will be got out.

As this mine is only a short distance from the Flin Flon property the erection of a

Power House and Dump, Moosehorn, Herb Lake.

smelter there would be of very material benefit, and would result in great increase of output and corresponding lessening of expense.

Lake Athapapuskow District

Until within a quite recent period the only claim of Lake Athapapuskow to distinction was that it was not only the largest of the many lakes in the district but with its numerous islands and rocky shores it was looked upon as an exceptionally beautiful body of water. Now this lake district gives promise of being the centre of great activity in the production of minerals. On the north shore of the east arm discoveries have lately been made which indicate that there is there a vast body of sulphide ore, running from $2\frac{1}{2}$ to 3 per cent. copper. From reports received it is estimated that this property may rival the Flin Flon discovery in extent and quality. A number of other finds have been made in the district, mostly copper. Geological indications point to the fact that there are other mineral deposits of value in the vicinity and further discoveries will doubtless be made from time to time.

Herb Lake Gold Mining District—Rex Mine

It was in the summer of 1914, at Wekusko, or Herb Lake as it is now more generally known, that the first important mineral discovery of the north was made. The prospectors who had this distinction were Messrs. Hackett and Woosey and the Kiski and Wekusko were the first claims staked. The discovery was a vein of gold bearing quartz showing considerable free gold. This find attracted wide attention and soon the whole shore of the lake north of the above claims and for some distance in was all staked.

Among the claims subsequently located were those of the Rex group, staked by Messrs. Campbell, Hassett and Moore. These have since become the best known in the district and now contain a producing mine. The preliminary work of stripping and trenching showed up a vein of such promise that a deal was consummated with Makeever Brothers,

mine operators of New York and Boston, whereby they undertook to develop the property, put up a mill and carry on mining work generally. The sinking of a shaft was commenced, and it was found that as the depth increased the vein widened. One shaft has been put down 120 feet and another to a lesser depth. Considerable drifting has also been done.

As soon as the road from the railway to the lake was completed last summer, a portable saw mill was taken in, set up and put in operation forthwith, to cut lumber for mine buildings. It was fortunate that logs for this purpose were available in the vicinity. A full equipment of mill machinery had already been shipped in.

Buildings were erected and machinery installed during the winter. The main building is 60x55 feet and shaft house 40x20x35 feet. Assay office was also put up. The camp buildings which are well built log structures were erected when the work on the claim was first commenced.

Machinery and equipment included a 10-foot Lane mill with capacity of forty tons per day, together with amalgamation plates and Deister Overstrom concentrating tables. The engine is 55 h.p. and there are two 60 h.p. return tubular boilers and a 390 cubic feet air compressor with modern equipment of air drills. Forty men are now required in connection with operation of the mine and milling plant.

May 1st, 1918, was an eventful day in the history of Northern mining for it was on that date that the Rex mill started crushing ore and with small interruptions for adjustments and cleaning, has operated continuously since. The first clean-up from 433 tons of ore crushed, resulted in a sponge containing 365 ounces gold, 82 per cent. fine, having a value of $6,186.53. Similar results were obtained from the next run of ore. These results are decidedly gratifying. To start up a small mill, and pay its way from the first month at a time when well known mines are shutting down on account of abnormal labor and commodity prices, is quite a feat and should definitely place Herb Lake on the map as a gold camp.

A few months ago when the owners had thoroughly satisfied themselves that they had a producing mine, a company known as the Herb Lake Gold Mines Limited was formed. Stock in this company is held mainly by Makeever Brothers, and the original owners of the claims. A few others have secured an interest but no stock has been put on the market in Manitoba.

The Moosehorn

To the Northern Manitoba Mining and Development Company is due the credit for being the first to make an ore shipment from Herb Lake as a commercial proposition. The company is composed of local shareholders, and owns the Moosehorn and other claims. Commendable energy was shown in development of the property. An 80-foot shaft has been sunk and some remarkable returns received from assays. A 50-h.p. boiler, air compressor, drills, hoists, etc., together with regular camp equipment are on the property.

The trial shipment was sent to Trail smelter. This consisted of 57,000 lbs. of gold bearing quartz, taken from the shaft in the ordinary way. The returns for the whole car were $2,323.60 in gold, or $81.53 per ton. Local capital, however, has not been found sufficient to work this mining property satisfactorily, so an interest therein has been disposed of to Makeever Brothers, who have undertaken to proceed with development work, and mining operations on the proper scale. As this mine is near the Rex the two properties can be worked together advantageously and with best results.

Other Properties

The Elizabeth-Dauphin claims are another well known group. Considerable work has been done thereon, including the sinking of a 50-foot shaft. The Pas Consolidated Mines Limited control the property and have undertaken to spend a large amount of money in development work during the current year.

Shafts from 30 to 50 feet in depth have been sunk on several other claims, particularly the Syndicate, Kiski-Wekusko and McCafferty. War conditions have, however, prevented

the programmes of the owners of these from being carried out, but they will be gone on with at a later date as the properties give good promise of satisfactory results.

New Discoveries

A sensational discovery has recently been made toward the North end of the lake by Paul Gasse, and associates, who have been prospecting that district for some considerable period. The deposits hitherto located have been in the nature of veins running from one to four feet in width. The new find is an immense dyke of gold bearing quartz in the granite. Should the whole body be found to be of uniform quality to that of samples taken and assayed this will turn out to be probably the most important discovery yet made in the district.

War conditions bear especially heavy on prospecting and mining operations, particularly in a new country. The kind of men engaged in these enterprises are those who are most useful in war work. The same can be said of many of the materials used directly or indirectly in mining development. Owing therefore to dearth of men and material, operations have been very much restricted but sufficient has been done to show conclusively the existence of valuable mineral deposits which only await the recurrence of normal conditions to bring into being several good camps.

The Pas, Man., July, 1918.

Mill at Rex Mine, Herb Lake.

Northern Copper Country Development

By J. A. Campbell, Commissioner of Northern Manitoba

Notwithstanding the scarcity of men in the North, brought about by military requirements, a certain amount of prospecting has been done this year, and some promising discoveries have resulted.

Lake Athapapuskow

On the border of Lake Athapapuskow several finds have been made which are attracting wide attention. Two of these, made by William Kerr and Fred Vedo, respectively, are at the northeast arm of the lake almost opposite Goose Creek. They were located early in the season, are in close proximity to each other, and have common characteristics. In each case several claims have been staked and other local mining men are interested with the discoverers. Some stripping and trenching has already been done and several pits sunk. Samples taken from these show calchopyrite and bornite and assays, of which a number have been obtained, indicate that the copper content is from 3 to 4 per cent.

Also, in the immediate district representatives of the Consolidated Mining and Smelting Company of British Columbia, owners of the Trail Smelter, have staked several claims. Mr. Cram, an official of the company, spent some time in that country recently. The main characteristics of these claims are similar to those above mentioned.

Farther east, at the extreme end of the lake, is a still more recent discovery made by Jacob Cook, an Indian prospector working for J. B. Cameron and associates. A small camp has been established there and commendable energy shown in investigating the nature and extent of the ore body. Some splendid specimens of calchopyrite and bornite have been taken from this property and assays run quite high. As a result the owners are quite satisfied with the prospects and are endeavoring to make arrangements for diamond drilling the property. If this approximates in extent in any way the Flin Flon property, it will be in the front rank as a producer.

Another important group of claims recently staked are those of Messrs. Moore, Hassett and Stewart, old prospectors in the district. These claims have attrrcted the attention of a New York capitalist through his Winnipeg representative who is negotiating for their purchase outright.

The Pine Root, Chica Claim, Phantom Lake

Near the mouth of the Pine Root river is situated the Chica claim, one of the earliest discoveries in the district. This was taken over by a syndicate of Duluth mining men, of whom Mr. E. A. Separk is the Treasurer.

Mr. Separk personally inspected the property and has been over a considerable portion of the district. An item of interest that is not generally known is that a diamond drill has been working on this property all summer, and that approximately two thousand feet of drilling has resulted. The work is in charge of Mr. W. J. Rashleigh and he and certain other members of the crew are also personally interested in the claim. This work is now being wound up for the season. As is usual in matters of this kind no information has been given out as to the character of the core but it is a fair inference that results have been reasonably satisfactory as it is the intention to continue the drilling next year. In addition to copper the assays show gold and silver.

At Phantom Lake, a short distance west of the Mandy mine, Gus Rosen is doing work on claims located by him, and which some residents of The Pas are interested. These show a variety of minerals, iron and copper sulphide and molybdenum and assays have also revealed the existence of nickel.

Flin Flon

Flin Flon camp is temporarily deserted; two years of diamond drilling have proven that the goods are there. Over twenty million tons of eight to ten dollar ore. But the development and operation of a property of that extent and character demand conditions where men and materials are readily obtainable, and these conditions most certainly do

not exist now. It is anticipated that these conditions will be materially changed before very long. Even now efforts are being made to arrange for the construction of a railroad into the district at an early date. The importance of the carrying out of such a programme can hardly be over-estimated and the result would be the removal of the main obstacle to the commencement of an immense copper mining industry.

The Mandy

On the other hand the Mandy camp on Schist Lake is one of continual activity. Why wait for the railroad when there is an ore body to work on which is solid calchopyrite

Mile 82 Hudson Bay Railway, and beginning of Herb Lake Road.

and runs over twenty-one per cent. copper? There is now a dump of five thousand tons of this valuable ore at the foot of Schist Lake, ready for the winter haul to Sturgeon Landing over thirty miles away.

This ore has been brought from the mine during the summer by barge, but low water prevented further transportation in this way. Before the season is over the pile will have been increased by an additional thousand tons, and at the mine another fifteen hundred tons will be ready for the teams. Forty-five men, all that can be obtained, are now employed. The shaft is down two hundred feet, with approximately one thousand feet of drifting. Mining operations will continue steadily throughout the winter.

Mr. Chas. Miller, ex-governor of Delaware, vice-president of the company, recently made a visit to the mine and found the work progressing very favorably under the management of superintendent H. C. Carlisle. While at The Pas he made arrangements for the hauling by team next winter of a minimum of ten thousand tons of ore and he expects that fully 15,000 tons will be taken out. The contract was let to Mr. C. B. Morgan, who has handled this work satisfactorily in the two preceding years.

It will come as a surprise to most people to learn that already three and three-quarter million pounds of pure copper have been realized from this mine, and it is confidently anticipated that this season's operations will more than double this total.

Copper Lake Sulphides

Peculiar as it may seem the most extensive ore body in the whole district is that regarding which there is probably the least general information. A very large body of sulphides consisting of pyrite and nickeliferous pyrhotite has been located on Brunne and Copper lakes, which lie about ten miles north-east of Athapapuskow and north of the Cranberry lakes. The discovery and first locations were made by Hugh Vickers in 1915, who staked four claims for himself and associates. On one of these, The Deighton, the mineralization extends nearly all over the west half of the claim and is continuous for the

entire distance of the four claims. The ore assays; iron thirty to forty per cent., sulphur twenty to thirty per cent., gold a trace to two dollars, silver a trace to a dollar and eighty cents., platinum a trace, copper a trace to 6-10 per cent. (twelve pounds to the ton) nickel a trace to 4-10 per cent. (eight pounds to the ton). The ore body is so large and so heavily oxidised that systematic sampling has not yet been attempted and the above results were received from massive unaltered sulphides picked at random.

J. P. Gordon who now holds an interest in these claims intends cross-channeling the lode with the intention of cutting through the gossan and heavy oxides and it is hoped that high grade streaks will be uncovered that will give the body a decided commercial value. J. B. Cameron has done considerable work on a claim to the south-west of the above claims and has exposed a large body of massive pyrites.

Stuart and Moore have a number of claims to the south-west of Cameron's. They have already done considerable trenching and intend working on the ore body during the coming winter. Mr. Stuart advises that their assays have been very encouraging.

Some idea of the size of this ore body may be conceived when it is explained that the body has great width and is continuous for five miles. But when one is on the ground the extent of the body and its irregular shape demonstrates effectually that the property cannot be investigated satisfactorily without the aid of a core-drill. The body contains millions of tons of sulphur (low grade), but if values are found in the base and precious metals, the sulphur contents may possibly some day become worth while.

The districts of Flin Flon, Schist, Athapapuskow and Copper Lake, will no doubt come into their own as shippers of concentrates when the transportation difficulties are solved, and a railway constructed into the country.

A New Gold Strike

The sulphides of Copper Lake have taken on a much greater interest of late owing to the spectacular gold find made by Karl J. Peterson. Peterson's find is in a quartz fissure vein about six feet wide which is cutting across the formation at right angles to the strike. The coarse gold was found within three hundred feet of the south boundary of the Deighton claim and the vein is exposed to where it disappears in the muskeg near the line of that

Bridge over Limestone River, Herb Lake Road.

claim. Some of the richest specimens of free gold ever shown in Manitoba have been taken from the Peterson claim.

Wekusko or Herb Lake District

The scarcity of labor, equipment and material required for mining purposes has been very greatly felt at this camp during the Summer. In order to make the best use of the labor available Mr. Walter Neal, superintendent for Messrs. Makeever Brothers, found

it necessary to transfer the men working on the Moosehorn property to the Rex Mine, and concentrate the work there. As a result the mill has been kept running a good part of the time, single shift, and the actual gold output for the months of June, July and August has been respectively $5434.75, $4378.92, and $3737.47. These returns, together with the May clean-up, were obtained from 1600 tons of ore crushed The force employed, however, is not sufficient to keep the mill in operation economically. Mr. F. G. Stevens, consulting engineer, has made an inspection of the property, and as a result special efforts will be made to get more men as soon as possible to increase the output of ore. About 300 feet of drifting has been done, and the assays show that values are keeping up well.

Definite arrangements have been made to start a gang of men on the Elizabeth-Dauphin claims, for the purpose of further development. Approximately $10,000 is to be spent on this property in the course of a year.

The conclusion of the war is bound to result in a very beneficial change in the situation in this camp.

The Pas, October 1st, 1918.

Future of the Mining Industry

"We know how important a part metals and the metal industries are taking in the present war, which has brought into prominent light an aspect of the question that has been almost entirely overlooked in this country heretofore. It is now seen that the possession of sources of the metals required in the manufacture of munitions of war is of great national importance, and that when it is attempted to draw up a list of these it appears that in some way or other they are nearly all required. This national need of the metals in times like the present becomes so insistent that other considerations, including that of cost, have to be put to one side.

"With regard to the future, it is a matter of common belief that metals and the metal industries, including that of metal mining, will play an important part after the war is over, and this belief appears to be well founded, for not only will there be the waste of war to be repaired and reinstated, but the world generally has been obliged to go short, for the period of the war, of a great variety of things into the construction of which these metals enter, and there will be this accumulated demand to be dealt with. Over and above this there is the further fact that we shall have great financial burdens to bear, in order to pay the interest, and it is to be hoped some amortization of our huge war loans, and the most obvious way to achieve this would seem to be to speed up our activities generally so as to produce more, and amongst other things to produce more metals."—*From a paper on "The Development of the Mineral Resources of the British Empire," by Wm. Frecheville, A.R.S.M., M. Min. Inst. M.M., Prof. of Mining at the Royal School of Mines, London, Eng.*

Herb Lake Road—a stretch of Muskeg.

Water Power Resources of Manitoba

By M. C. Hendry, Winnipeg

(With permission of Water Powers Branch, Department of the Interior, Canada)

The present bitter conflict, in which practically the whole world is engaged, promises to be but a forerunner of another, though of a different character, that will follow the advent of peace. It is certain that following the laying aside of arms the world will become at once engaged in a commercial conflict, in which no quarter will be given or asked. Such a contest will be the logical outcome of the present state. Every nation will be carrying an overwhelming load of debt, relief from which can only come through building up or rehabilitating an export trade, whereby its national obligations may be met.

The expenditure of natural resources during the world war has been staggering. Increased conservation will be imperative and careful development of new sources of basic materials will be required. Plans and policies to the above ends are being elaborated by all the nations engaged in the present conflict, and in this connection it is of particular interest, in view of the great natural resources of Canada, to note what is being done along particular lines by Great Britain. Fifteen to eighteen months ago a commission known as the Dominions Royal Commission toured the British Empire. The Commission held a series of meetings at various points in Canada, with the object of obtaining first-hand information regarding Canada's natural resources, for transmittal, in the form of a report, to the Imperial Government. Special interest was centred on the power resources of the country, as it was recognized that the development of the natural resources, in the presence of the keen competition which will follow the termination of the war, can only be consummated where there are sources of cheap power, either fuel or water power. At the hearings held in Winnipeg particular enquiry was made regarding the water powers known to exist in Manitoba.

Latterly there was formed in Great Britain an organization known as the "Conjoint Board of Scientific Societies," whose particular duty was to secure and co-relate information regarding the resources of the Empire. The Board is made up of various committees to deal with different branches of investigation. One of the most important was the Water Power Committee. At the request of the British Government this committee prepared a report on the water power resources of the British Dominions.

The action of the British Government in these two cases emphasizes the important part a cheap power source will play in the development and manufacture of natural resources following the cessation of military hostilities, a development necessary to enable the Empire to recover from the financial burden imposed by the war.

In this development Manitoba must take her part. What may be termed Old Manitoba has long been noted for the production of wheat and other grains. In the recently added territory known as New or Northern Manitoba an entirely different field for development is opened up. The territory referred to comprises an area of 178,000 square miles, by far the greater part of which is quite remote from any railway, though the Hudson's Bay Railway will eventually extend from The Pas to Port Nelson on Hudson's Bay, traversing the new territory from north to south. Necessarily under these circumstances very little is definitely known regarding the potential wealth of this vast area, but what has been discovered is already of great importance.

Explorations made during the last fifteen or twenty years have done much to determine in a general way the resources of the country. These investigations indicate that they are varied. Regarding agriculture; it has been determined that in spite of preconceived ideas there is a great field for this form of industry and indications are that the new territory can and will support a large population in the future. The forest wealth is of great magnitude, though practically entirely undeveloped, due in a large measure to lack of transportation and the remoteness of a market. The mineral wealth would appear to

promise the greatest field for endeavor. Some prospecting has been done following the building of the railway from The Pas, and although the field covered is very limited, the discoveries made are excellent. Naturally the development and discoveries so far made have been in the area most easily reached from outside. The impression gained, however, in view of the lack of transport and the comparatively few prospectors working in the country, is that there is vast wealth in mineral resources, the fringes of which have just been touched. Those who are more closely in touch with conditions look for a great prospecting and mining activity when the war is over and men and money are released for the work.

Cheap power is a prime requisite in the development of the natural resources of the country, either fuel or water power. During the early stages of development, especially of the minerals, the available wood supply may be depended upon as a source of power. The experience in other mining districts has been that this source of power must be supplemented by some other form early in the development. Situated as Northern Manitoba is, in relation to coal area, power derived from such a fuel source would be costly. Fortunately the whole northern part of the Province is richly endowed with water power and this will constitute one of the chief resources of the Province.

White Mud Falls, Nelson River.

The field in which water power may be used is rapidly expanding, and in speaking of water power it should be pointed out that it is here referred to as a prime mover, which may be used directly for mechanical operations such as grinding pulp, etc., or to generate electricity for utilization either in the immediate vicinity or at a distance from the plant. Many recent developments in engineering science have rendered possible the utilization of hydro-electric power in fields formerly closed to its use. Improvements in electrical transmission have eliminated difficulties of utilization formerly due to the remoteness of the power sites from centres of industrial activity. Developments in electro-chemistry and electro-metallurgy have rendered it possible to handle materials formerly unworkable. The production of such materials as aluminum, carborundum, calcium carbide, chromium, silicon, cyanamid, etc., have been made commercially possible through electrical processes. Also phosphorus, magnesium, hypochlorite and sodium nitrate are most economically produced by the use of electric energy, while recently great strides have been made in the electric smelting and refining of metallic ores.

The production of fertilizers offers a wide field for exploitation. The world's consumption of that commodity amounts to about 6,000,000 tons per annum. As the source of natural fertilizers are becoming depleted the demand for substitutes is rapidly increasing. It has been estimated that Canada alone will ultimately require 10,000,000 tons of nitrate

per annum to maintain the fertility of the soil. If these nitrates were produced by the cyanamid process practically 3,500,000 h.p. would be required for such an output.

The electric smelting of iron ore offers a field for the use of water power. It has been suggested by competent authorities that the presence of water powers in Canada offers a solution to the problem of developing ore bodies that at present are lying dormant owing to the great drawback imposed through the absence of fuel at low cost. The opinion has been advanced that the iron ore bodies known to exist on the east coast of Hudson's Bay may be developed through the power potentialities of the Nelson river, ready market access to which is possible by means of the Hudson's Bay Railway.

Recently when discussing the fuel and power situation in the East a prominent engineer pointed out that in the near future it might be found of advantage and in the interests of true conservation to close power sources in the more highly developed parts of the country to large local industries, such as electro-chemical or electro-thermol plants in favor of the greater number of small varied industries and divert them to more remote sections where large quantities of power were available, as for example the Nelson River.

In the coming world commercial competition it is very satisfactory to note in what a favorable position Canada and particularly Northern Manitoba is placed. The fact that water power is to be found in unprecedented amounts, coupled with the presence, in close proximity, of mineralized area and railway facilities leading to an ocean port, places the province in an enviable position.

Power

By no means all of the power possibilities of the district have been investigated and detailed information is available for only a very few of the possible sites, but sufficient general information has been gathered to render possible the formation of a fair estimate of the amount available on the main rivers.

Those rivers regarding which most definite information is available include the following—

Saskatchewan
Nelson
Grass
Burntwood

Regarding the Hayes River little is definitely known.

Saskatchewan River

The Saskatchewan River forms one of the main drainage systems of Western Canada. Both its main branches head on the eastern slope of the Rocky Mountains and through their numerous tributaries drain the whole of the eastern slope of the Main Continental divide lying north of the International Boundary as far as latitude 53 degrees. The country drained has an area of 155,000 square miles. The greater part of this area is comprised of open prairie country where the run-off is small; in consequence the river depends largely upon the mountain and foot-hill country for its water supply. This feature has a marked effect upon the regimen of the river, the flow during the winter months being very small as compared with the summer discharge. Based upon records of the Manitoba Hydrometric Survey, covering the period 1912 to 1918, the following figures for discharge have been prepared:

Ordinary minimum flow	5,970 sec-ft.
Estimated flow for maximum development	20,110 sec-ft.
Dependable flow with storage	15,000 sec-ft.
Maximum recorded flow	87,500 sec-ft.
Minimum recorded flow	5,070 sec-ft.

The power producing section of the river is that stretch between Cross Lake and Lake Winnipeg. The difference in level between these two lakes is 103 feet. According to the information obtained by the Dominion Water Power Branch this fall may best be developed at two points, both of which are located near Lake Winnipeg. At the upper site a total head of 57 feet would be available. The head water would stand at Cross Lake level. At this site the ordinary minimum power output at 80 per cent. efficiency would be 30,900 h.p. This amount

could be raised to 77,700 h.p. by means of storage development. At the second or lower site a head of 41 feet could be developed. The ordinary minimum power output on the same basis as above would be 22,250 h.p., which output would be raised by utilizing the storage to a continuous dependable output of 55,900 h.p.

At present there is in hand a scheme to develop the upper site in connection with the manufacture of pulp and paper. Undoubtedly this proposition would have been under way had not the war, with the consequent difficulties of financing and labor, intervened. It appears quite certain that as soon as conditions approach normal this scheme will be gone on with, in which event the rapid growth of an industrial centre at Grand Rapids may be confidently looked for.

Nelson River

The Nelson River is one of first importance, forming the outlet of one of the main drainage systems of the continent. The territory tributary to this river has a very wide range in physical features. It varies between the rugged and mountainous country of the Continental divide and the flat low-lying swamp area of the lower Saskatchewan. The variation in vegetable cover is great, large area being covered by dense forest growth, as compared with the open stretches of the western prairies. In the south-western part of the drainage area the soil cover is deep and few lakes are to be found, while in the eastern and northern sections the soil is generally thin, the rock is largely exposed, and many lakes are scattered throughout the territory.

The immediate source of the Nelson River is Lake Winnipeg, which acts as a collecting basin for greatest part of the drainage area. It forms one of the largest fresh water bodies on the continent, with a surface area of 9,414 square miles. The principal rivers draining into the lake are the Saskatchewan, Dauphin, Red and Winnipeg.

The total drainage area of the Nelson River is 450,000 square miles. With such a large area the run-off may be expected to be large. The length of the river is approximately 450 miles, and in this distance the total fall is 715.00 feet. The greater part of this fall is concentrated at the numerous falls and rapids which occur throughout the length of the river, and it is this feature, coupled with the large discharge, that makes the Nelson River so important from a power producing standpoint.

In the upper reaches the Nelson River is made up of a number of lake-like expanses connected by short stretches of river which are generally broken by rapids and falls. Between Sepiwisk and Split Lake is a large stretch of river free from islands and interrupted by very few rapids. Below Split Lake numerous islands are encountered and the rapids and falls are numerous. Rock outcrops are in evidence at practically all the rapids. The banks are generally

Panoramic view of Three Span, Single Truss Bri

higher in the lower reaches and the rock is covered with a greater overburden of clay. The river is navigable by small boats between the rapids, but except at the upper and lower ends the reaches open to uninterrupted navigation are short. The Hudson's Bay Railway crosses the river at two points, Manitou and Kettle Rapids. Above and below these points the railway is never at a great distance from the river, hence access to it at various points is comparatively easy. In the event of power development at any point only very short spur lines would be required.

No systematic surveys have been made to determine possible points at which the fall in the river might be concentrated, but from various observations the height of the falls has been very closely ascertained. On this account it is necessary in discussing the probable power output of the river to base the estimates on the fall at the various rapids and falls without any reference to the best method in which the whole fall might be utilized.

Regarding the discharge of the river more definite information is available. Estimates of daily discharge, based upon measurements made at Shell Rapids by officers of the Manitoba Hydrometric Survey and observed gauge heights at Norway House are available for a term of years. These indicate what may be expected as a probable minimum flow, also the probable regulated discharge by developing storage on Lake Winnipeg.

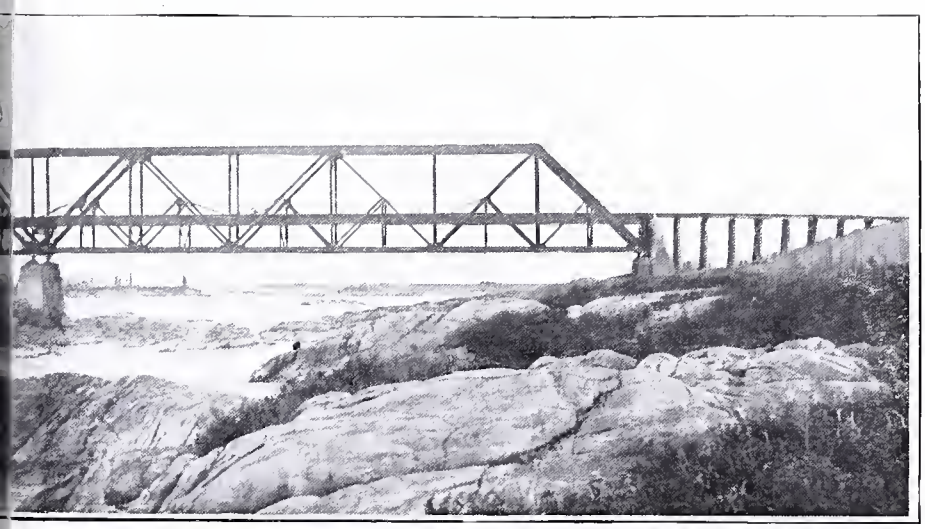
Lake Winnipeg offers splendid opportunity for the development of storage, as very little range in lake level (from one to two feet) would provide for almost complete regulation of the Nelson River. This undertaking would involve considerable expenditure, but will be quite feasible economically when any considerable development of the water powers on the river has been accomplished.

From the records referred to the following figures relating to discharge of the Nelson River have been prepared:

Ordinary minimum flow	50,000 c.f.s.
Estimated flow for maximum development	80,800 c.f.s.
Dependable flow with storage	75,000 c.f.s.
Maximum recorded flow (Norway House)	122,000 c.f.s.
Minimum recorded flow (Norway House)	42,750 c.f.s.

From these figures it will be seen that the natural regulation is good, the variation between maximum and minimum flow being small, which is a much desired feature where hydraulic developments are concerned.

Regarding the head available at the various rapids and falls, this can only be finally determined by careful surveys, but the natural drop varies from 10 to 50 feet; they are, therefore, all low head propositions. This disadvantage is largely offset by the magnitude and



...on River at Kettle Rapids. Hudson Bay Railway.

small variation of the flow. The developments would all be large undertakings, but the opinion is ventured that the capital cost per horse power developed will compare very favorably with similar undertakings on this continent. As a measure of the size of any development the amount of power available per foot of head calculated at 80 per cent. efficiency for "ordinary minimum flow," "estimated available for maximum development," and "dependable flow with storage," is 4,454, 7,345 and 6,817 h.p. respectively.

Available information indicates that 538 feet, out of a total fall of 715, may be developed at various points. Detailed surveys which must ultimately be made may decrease or increase

Rapids below White Mud Falls, Nelson River.

this amount. In the aggregate the power that may be developed on the Nelson runs into very large figures. With the possible exception of the Columbia River, it has the greatest amount of potential power capable of development of any river on the continent. Upon the basis noted before the corresponding figures are 2,445,000, 3,952,000 and 3,668,000 h.p. respectively.

Churchill River

The Churchill River also presents considerable power possibilities, though through lack of definite information regarding discharge, except for a few isolated measurements it is impossible to state with any degree of accuracy the probable output of power for any particular rapid or fall. From source to mouth the river is 1,200 miles in length and the drainage area is estimated to be 114,000 square miles. Since practically the whole basin lies in unsurveyed territory it is impossible to delimit the boundaries. The area given is, therefore, only approximate. In Manitoba the first fall of importance met with descending the river is Granville Falls, above Granville Lake. Here a drop of 25 feet occurs, though there are few rapids between the Manitoba boundary and Granville Lake which necessitate portages. The next important fall going down stream is below the outlet of Southern Indian Lake, which is known as Missi Falls. It has a drop of 18 feet. Between Southern Indian Lake and the mouth of the Little Churchill the whole river has not been explored. However, in the 23 miles above the latter point it is estimated the river has a total descent of 170 feet. Below the mouth of the Little Churchill numerous rapids occur, especially in the first 30 miles. The total fall in this section is not known, but between the point named and mouth of the river there is a difference in level of 400 feet.

Measurements of discharge were made on the Churchill just above and below Reindeer River by interested parties in the summer of 1917. During the winter of 1917-18 an officer of the Irrigation Branch, Department of the Interior, secured a series of measurements at the

same location. These indicate that a discharge of from 20,000 to 25,000 second-feet may be expected during the winter season.

The best available information indicates that the total fall in the river below the Manitoba boundary is 900 feet. If one-third of this fall can be developed, which would appear a reasonable assumption, the power output of the river during the low water season would be in excess of 500,000 h.p. That part at least of this potential power is at present in demand is indicated by the fact that a company has been formed to develop power on the Churchill River for transmission to the mines near Schist and Flin-Flon Lakes, and considerable engineering investigation has been done to this end.

Grass and Burntwood

Other rivers which may be considered as power producers are the Grass and Burntwood rivers. Each is a tributary of the Nelson. Between them they drain the territory lying between the Nelson and Churchill rivers, east of the Manitoba boundary.

The Grass River is roughly paralleled by the Hudson's Bay Railway. There are several falls or rapids on the Grass River where heads of from 35 to 55 feet might be developed. All of these are comparatively near to the railroad, the most remote being at a distance of 20 miles. Any developments on this river would have a comparatively small power output, for, while the heads available are fair, the flow of the river is small. Lack of continuous records of discharge do not permit of reliable estimates of the power available, but the few measurements obtained indicate that the power output for the whole river would be approximately 5,000 h.p.

The Burntwood River is of about equal importance as the Grass from a power-producing standpoint. It is more remote from the railway than the latter, as it drains the territory lying between the Grass and the Churchill rivers.

Except for a few meterings made at various points on the river during August and September of 1915, nothing is known regarding the discharge. It would appear probable that the regimen is much the same as that of the Grass, however. An investigation made of its power possibilities during the period mentioned led to the conclusion that there were several falls

First Falls, Odei River.

or rapids where power might be developed. The fall at these ranges between 25 and 55 feet. No attempt has been made to form an estimate of the power available, but it would appear that an output equal to that of the Grass River is a reasonable assumption.

Hayes River

The Hayes River, lying to the east of the Nelson and flowing into Hudson's Bay, also offers power possibilities. The information regarding the discharge as in the case of the Grass

and Burntwood rivers is so meagre that no attempt is made to estimate the probable output. In one stretch of the river there is a fall of 285 feet in a distance of 35 miles. The banks are fairly high, and heads of from 35 to 40 feet could be created by dams. It would appear, therefore, that the power output would be fairly large.

Summary

Summing up, the power outlook for Northern Manitoba is very promising. The following table shows what is at present known regarding the water power situation in Northern Manitoba.

River	Horse Power Available	
	Ordinary Minimum Flow	Dependable with Storage
Saskatchewan	53,200	133,600
Nelson	2,445,000	3,668,000
Churchill	500,000	500,000
Grass	5,000	5,000
Burntwood (say)	5,000	5,000
Total	3,008,200	4,311,600

The foregoing table would indicate that there is sufficient water power available in the various sections of the country to take care of all local requirements that may develop. In addition, the potential power situation on the Nelson and Churchill will permit of great industrial expansion, especially in its relation to electro-chemical and electro-metallurgical processes.

The administration of water powers in Manitoba is vested in the Dominion Government, and is handled by the Dominion Water Power Branch, Department of the Interior. This branch, through a local organization known as the Manitoba Hydrometric Survey, has conducted water power investigations throughout the Province. Surveys have been made and data relating to run-off of the rivers has been gathered. In Northern Manitoba, owing to its remoteness and sparse settlement, these investigations have been of a reconnaissance nature only, but advantage is being taken of every opportunity to extend the field covered.

Tasginigap Falls, Burntwood River.

The Rice Lake Gold Area

By C. A. Bramble

The History of the District

Older than any other mining district in Manitoba, that of Rice Lake is only now beginning to attract the serious attention it deserves. Through no fault of its own it has almost stood still for years. Claims have, it is true, been staked, a certain amount of assessment done, a few shallow shafts sunk, and abundant samples of rich gold-quartz brought out, but at this writing no stamps are dropping and no bullion is being produced.

Yet those who have believed in the district, believe yet; their faith is not in the least shaken, for they understand the many adverse conditions the pioneers have faced. To grasp the situation one must weigh the various factors of the problem. The initial discoveries were made before the Klondike rush of 1898, on the extreme limit of the district; that is to say, close to Lake Winnipeg, in the neighborhood of the mouth of Hole River. The ore proved low-grade, and funds were lacking, apparently, to test the finds at all thoroughly, so when the world went wild over the riches of the Yukon, it need not cause surprise to learn the prospectors abandoned their claims and made for the new El Dorado.

An interval of ten years separated these attempts from the next. Once again shots were heard along the lake front, and one company even got so far as to obtain patent to several claims, but again capital was shy, and development came to a standstill. Manitoba has always been famous for its fertile wheatlands, and Winnipeg financiers have been too busy with wheat and real estate to take any deep interest in mining. A little geological knowledge might have pointed to probable deposits of metallic minerals, but seemingly such knowledge was generally lacking, and it was taken for granted that neither a Cobalt nor a Klondike would ever be found in Manitoba.

However, a certain amount of curiosity had been aroused by the finds of 1907; a few restless spirits drifted into the back country, and some of the more intelligent Indians began to search for gold-bearing veins. Before long the Gabrielle, by the shore of Rice Lake, was staked, and from the surface yielded surprisingly rich specimens of gold-quartz. A large sum was spent upon this claim, but possibly not spent to the best advantage; and in the end those who had taken an option threw this up. However, to the eastward of the Gabrielle a nest of wonderful surface showings had been found, and such prospects as the Gold Pan, Gold Seal, and Moose were sufficient to attract men from far and wide. Thus hundreds of claims were soon staked, many of them of great promise, while not a few were just "claims."

In a great majority of instances the prospectors who took up these claims were travelling on a grub-stake, and represented men of little financial strength whose desire was to get a claim cheap and sell it at a profit. With dozens attempting to do this, while comparatively little money was being spent on testing the different veins, it should be clear the situation was not an encouraging one. Few engineers penetrated the field; those that did reported that while surface showings were good so little work had been done that no intelligent man could or would hazard his professional reputation on any evaluation of the prospects he had seen. Although within a hundred miles of Winnipeg, the journey into the district was often long and always tiresome and fatiguing; the big capitalists, therefore, kept religiously away.

Yet the original discoveries led to others, and, gradually, the field was extended, taking in, at length, the Long Lake district to the eastward, and that of Hay Lake many miles northwest. As constituted to-day the Rice Lake district extends for at least eighty miles in a northwest south-east line, while its width is not known with any approach to certainty. The odds are enormously in favor of such an extension to its boundaries as will make the original plat the smallest part of it.

To-day the Gold Pan and the Luleo group—the latter a recent find—are being developed actively, and much money is being spent in making these encouraging prospects into mines The deepest shaft in the district, that of the Gold Pan, is down 200 feet, while the Gabrielle, Gold Seal, Moose and Luleo have each shafts of between fifty and a hundred feet.

Had it not been for the war, with the consequent timidity of capital as regards gold mining, and the superior attractions of the war-minerals group, it is improbable the district would have

stagnated so long. As it is, the turn seems to have been passed, and with several companies spending large sums on their prospects, those who should be the best judges feel assured that the Rice Lake district has, at last, come into its heritage, and with its sister camps of Schist, Athapapuskow, Herb and Star Lakes, will start such an era of prosperous mining as will put Manitoba on the mineral map for all time.

Rice Lake and its Geology

Although several geological-reconnaissance reports have dealt with the Rice Lake district, so much remains to be deciphered and correlated that it is impossible to speak with any confidence on the exact sequence of the formations in this field. The general strike of all strata is north-west and south-east, and, as is usually the case, the rivers flow in valleys eroded out of the softer rocks. This led to an erroneous conclusion when men first penetrated the field. Seeing what was presumably granite a short distance back on either hand, it was supposed the mineralized belt would be confined to the neighborhood of the streams, and that prospecting would not yield profitable results excepting in the valleys and by the shores of the many lakes and lakelets.

The labors of our geologists, however, brought certain facts to light which materially discredited this conclusion. Instead of the altered sedimentaries being flanked by barren "Laurentian" granite, as had been assumed, it is more than questionable if there is any of this so-called Laurentian granite in the district. Granite there certainly is, and much quartz-porphyry, but this granite may, as first suggested by Dr. R. C. Wallace, of the University of Manitoba, be actually the youngest rock found in Rice Lake district; and it has, seemingly, been the mineralizing agent which enriched the veins.

Gold occurs in veins and shear zones traversing a country rock of quartz-porphyry or altered sedimentaries, and numerous discoveries, far removed from the softer schists which form the beds and banks of many streams, have given confidence to prospectors, so that they no longer limit their ramblings to the neighborhood of rivers and lakes, but strike boldly across country. These extended wanderings almost prove that the mineralized country is so vast as to promise an extensive field for mining operations.

According to J. R. Marshall, the most recent investigator of the district, the oldest rocks are Keewatin lava flows. These are intruded by quartz-porphyry, quartz-feldspar-porphyry and feldspar-porphyry, and constitute the main gold-bearing formation of the district. Younger than these is the hornblende-granite before mentioned, which intrudes each and all the rest.

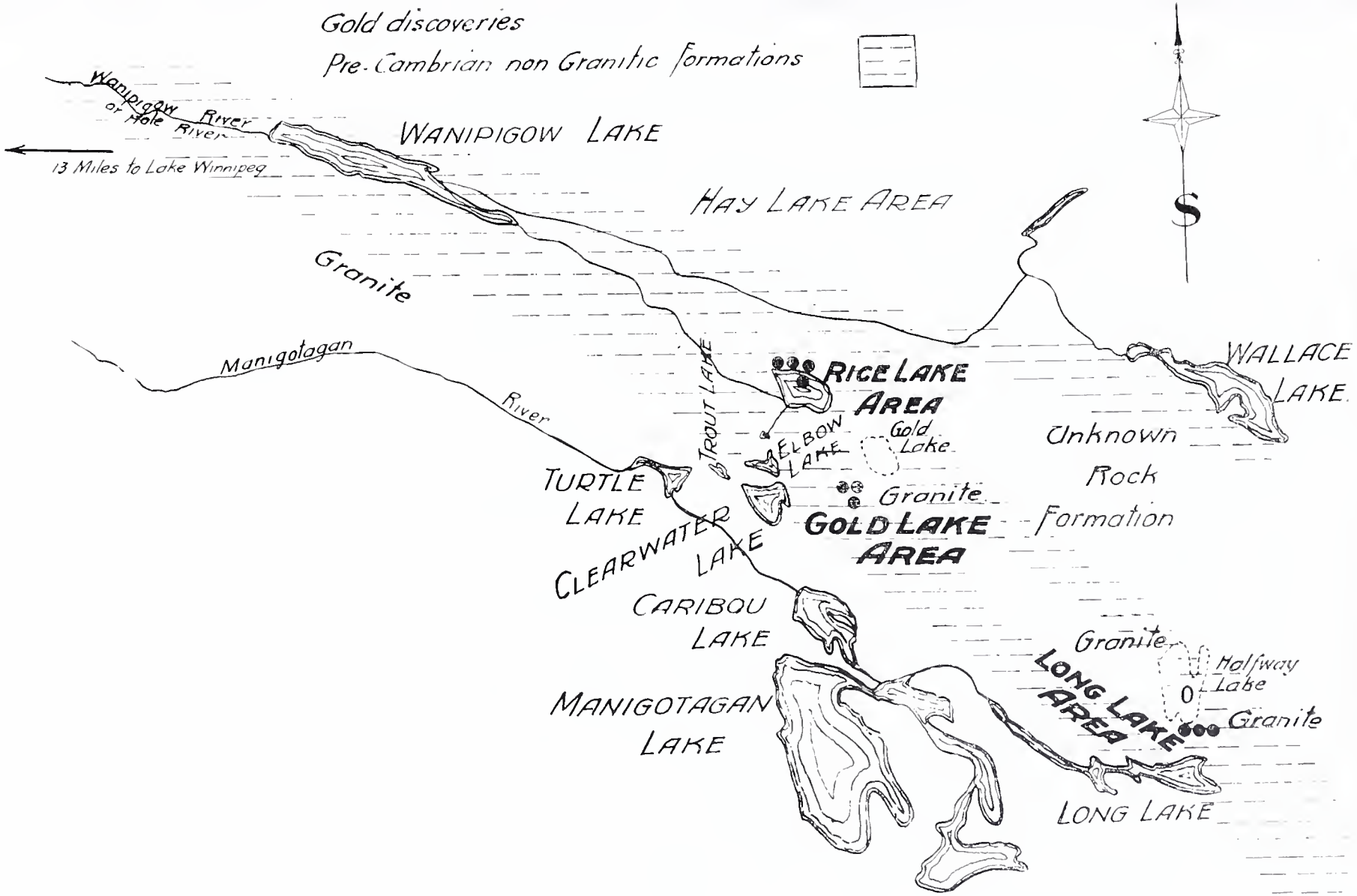
The type Keewatin rock is possibly a schist, grey-green in color, with hornblende and feldspar scattered liberally through it. Black, glistening hornblende schist is found near the contact with the granite. Ash-grey rocks and coarse volcanic breccia also occur. The whole of the area is most promising from the point of view of the prospector.

The Winnipigow or Hole River has given its name to a series of schists and gneisses which are believed to be altered sedimentaries. At one time this series was not considered good prospecting ground, but some of the most promising discoveries have been made quite recently in just these rocks. Until we know more than at present, it will be unsafe to condemn any of the formations so far found, as finds of value are quite likely to be made in any of them.

Undoubtedly, however, the various porphyries have shown the best results. These intrude the Keewatin and are themselves penetrated by the granite. In color they are grey-green and of medium texture, and as the porphyries grade by imperceptible graduation into the granite it has been deduced that both were originally of the same magma.

The practical application of these deductions is that while a majority of the veins carrying gold have been found in the porphyry, the granite and schists have proved auriferous as well, hence should not be neglected by the prospector. The veins run, almost invariably, with the strike of the rocks, and are often found, in reality, filling in a zone of shear, but often such zones are quite narrow. In fact, large bodies of vein matter are the exception, barring certain cases which will be pointed out in discussing the various mining properties.

In the Long Lake district the accessory minerals are pyrite, chalcopyrite, bornite and marcasite, of which the first is by far the more abundant. In the Hay Lake section of the


Gold discoveries
Pre-Cambrian non Granitic formations
Wanipigow River
or Hole River
WANIPIGOW LAKE
13 Miles to Lake Winnipeg
HAY LAKE AREA
Granite
Manigotagan River
TROUT LAKE
RICE LAKE AREA
ELBOW LAKE
Gold Lake
Granite
GOLD LAKE AREA
TURTLE LAKE
CLEARWATER LAKE
CARIBOU LAKE
MANIGOTAGAN LAKE
WALLACE LAKE
Unknown Rock Formation
Granite
Halfway Lake
Granite
LONG LAKE AREA
LONG LAKE
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district, several miles west of its centre, pyrite is practically the only accessory mineral in most of the veins, and it is always highly auriferous. Not seldom pure white quartz of the milky variety carried gold in sufficient amount to warrant its being worked as an ore. Careful panning will, however, usually show colors in the pan, but the surest test, and one which the prospectors should insist upon, is a fire assay.

Rice Lake District Mines

Since the day when Gabriel Sinclair, an Indian trapper, discovered the Gabrielle vein by the shore of Big Rice Lake, between two and three thousand other claims have been staked. Of these about 1,800 are yet in good standing, and an amount of work done which in the aggregate has cost no small sum.

On the Moose, a shaft 105 feet in depth has been sunk, and 240 feet of drifting done. This property is well equipped with compressor, steam hoist, and buildings better than are generally provided in the early days of a mine's history.

The Gold Pan shaft is down below the 200-foot level, and drifting has begun. The property is well equipped with the usual sinking outfit, and the manager is sending in, just as soon as a winter road exists, a small mill, which it is expected will suffice to turn out a considerable amount of bullion, on account of the very rich quartz which is available.

The Gabrielle, the first mine staked in the district, is not at present under active development owing to a shortage of funds. Two shafts have been sunk—one of 78 feet, the other of 50 feet, and drifting to the amount of eighty feet, or so, accomplished. This property may resume development shortly, as arrangements are understood to be on foot having this end in view.

The Independence shafts are two in number; the one down 55 feet, the other 45 feet.

On the Big Four there is a 100-foot shaft and some cross cuts.

The Chicamen shaft is down 70 feet, while there are cross cuts of 70 and 45 feet respectively.

The Pilot shaft is sunk to 70 feet; the Goldfield has one of 80 feet, and has drifted 40 feet along the vein; Gold Cap shaft is 70 feet; Ranger, 60 feet; Emperor, 69 feet; Gold Pan Fraction, 53 feet; and Island, 50 feet.

The foregoing list may not include quite all the sinkings, as the claims are scattered, and until returns of work are made it is difficult to know just what each property has done or is doing, but it certainly comprises all the more important developments.

However, there is one important exception: Far to the north-west, beyond the Winnipegow River, not far from Hay Lake, there is a group of claims the best known property of which is the Luleo. Here strong financial men have acquired control, and are pushing development in a way that is only possible with abundant funds at disposal. The gold occurs along a broad zone of sheer, heavily mineralized with a gangue of quartz, and abundant sulphide of iron. Much free gold is in evidence, and the sulphides give high assays. Here a shaft has been sunk to 50 feet during the past summer; much stripping and open cut work advanced, and the machinery for a twenty-stamp mill forwarded to Manigotagon. This mill, however, is to be used merely as a testing-mill. By its aid the property is to be thoroughly tried out, and if the 3,000-foot vein holds out to its present promise there is no doubt a very extensive plant will be erected.

In this region—the so-called Hay Lake district—are several other claims upon which more or less development work is being done, and those who know it say it will rival and more than rival the older region between Rice and Gold lakes.

The Gold Lake region is, approximately, in the centre of the district, for the Long Lake country lies about as far to the south-east as does the Hay Lake to the north-west. Here, too, little work has been done to warrant any sure conclusion, but some of the claims lying to the north of the eastern end of Long Lake give decided promise. Some of these were the means of exploding the theory that the "granite" of the district would not prove to contain auriferous veins. The said granite is in many cases a granite porphyry, and in it have been located veins

SCENES IN THE RICE LAKE DISTRICT

Kettle Falls on the Winnipegon River (*top*)
Shaft at the Moose Mine (*second*)
Shaft at the Gold Pan (*third*)
Gold Pan Camp (*bottom*)

showing considerable free gold, and, seemingly, quite as rich and persistent as those cutting the schists and diorites of the Gold Lake section.

A few prospectors have ventured further up the Manigotagon and claims have been staked almost up to the Ontario boundary, many miles above Long Lake.

According to Dr. Dresser, of the Geological Survey, who visited the field in the summer of 1917, there is a most promising area awaiting exploration much nearer to the mouth of the Manigotagon than Rice Lake. He found schists and altered sedimentaries crossing the river in a broad band, but a few miles above the outlet of the river into Lake Winnipeg. Provided further investigation shows this belt to be auriferous, the present workings will be connected by a chain of prospects with the initial finds along the shore of the great lake, and the district may be considered as extending, as previously stated, for a stretch of some 80 miles north-west to south-east, with an undetermined average width, but known in places to approximate ten miles.

It seems hardly possible that the finds of gold-bearing quartz will be limited to the area at present known. The amount of new country open to the prospectors is vast, and it will be many years, even with a greatly increased number of searchers, before a bound may be set to the probably mineralized area. There is room and to spare for much prospecting in eastern Manitoba, and no doubt the interprovincial line will not limit the discoveries, but rather will valuable claims be found in the adjoining Ontario hinterland. Unfortunately, the line between the provinces has not been deliminated, and as the laws regulating staking are different, it may well be that a considerable amount of confusion and possibly of litigation will result. This line is an urgent necessity, and an effort should be made to have it run without loss of time.

Means of Access

It seems somewhat absurd to speak of a district being difficult of access when it is less than one hundred miles from the capital of the north-west, yet any man who has had business there, until this year, will agree that Rice Lake was a hard place to reach. The recognized route has been by way of the Manigotagon River. During the season of open water the traveller took ship at Selkirk, or Riverton, for Manigotagon Settlement, which same is at the mouth of the Manigotagon River on the east shore of Lake Winnipeg. Selkirk is twenty-four miles from Winnipeg, and may be reached by rail, electric car or road, and to the mouth of the Red River is 25 miles further. From the outlet of the river to Manigotagon is 45 miles. The alternate route involves a journey by rail to Riverton, which is a run of 84 miles, and from there a sail of another 40 miles lands the voyageur at Manigotagon. Until the spring of 1918, the winter route has been to Riverton and thence by team or dog train to Manigotagon, but the Provincial Government set aside an appropriation last winter for a road from Fort Alexander, near the mouth of the Winnipeg River, to the centre of the district at Clearwater Lake, about forty miles. Fort Alexander is reached by way of the C.N.R. to Traverse Bay, which is but 67 miles from the beginning of the winter road. It is now possible to leave the city by the morning train and make the district late that night, but to do this the conditions must be at their best; it is wiser to count on a two-day journey, sleeping at the crossing of Black River, 25 miles from Fort Alexander.

But to resume the description of the Manigotagon route: The centre of the district, which may be taken as in the neighborhood of Clearwater Lake, is 45 miles above the settlement, following the course of the Manigotagon or Bad Throat River. This is generally held to be a journey that will occupy two short winter days. Thus, in theory, the older route required some four days to reach the camp, but in practice what with storms and other delays it has frequently taken much longer. Freight rates have been high, partly because of the difficulties of the road and partly because of the absence of much competition among the freighters. As much as 10 cents a pound has been paid to transport mining machinery and supplies from Winnipeg to Rice Lake. Moreover, heavy freight could only be moved during winter, after the ice had taken, and before the spring thaws, or from about December 10 to March 15. Any goods sent to Manigotagon at other seasons had to remain in storage until winter conditions prevailed.

These drawbacks are, however, being removed, and this coming winter much of the heavy freight will be hauled to the district by way of the new winter road from Fort Alexander, thereby effecting a saving of both time and money. The Hay Lake, and possibly the western part of the Rice Lake district, will probably be served in future by the Hole River route. A company, with strong financial backing, is operating the Luleo group north of Hole River, and as work is being conducted on an extensive scale transportation will be arranged from the mouth of the Hole River. But, nevertheless, it will be costly and slow to move heavy freight into the Hay Lake country by way of Riverton in winter. The haul from the end of the steel to the Luleo will be not less than 80 miles. In summer this particular section will enjoy comparatively good facilities. A moderate sized steamship can take on freight at Winnipeg and discharge it at the first portage of the Hole River—which has been cut out to pass a series of falls seven miles above the mouth. Here a tramway is to be installed, and freight transferred over it to a smaller craft which will carry everything to a point opposite the Luleo camp 20 miles further. Could a lock be built at the falls, cargo need not be broken between Winnipeg and Luleo Landing, and possibly some such solution of the transportation question will be adopted.

But it is inevitable that once the district has proved its worth a railway will be a necessity; then quite low-grade properties, of which there are many, will be workable at a profit. It is said the survey made by J. D. McArthur interests show that such a road could be constructed economically and quickly.

General View of Port Nelson showing Bridge to "Island" where ships will load.

Geological Features of Rice Lake District

From Report of Prof. R. C. Wallace and Prof. J. S. DeLury, Dept. of Geology and Mineralogy, University of Manitoba, July 1916

The mining district is situated in a comparatively narrow belt of sediments, greenstone and porphyry, which follows the trend of the Bad Throat and Hole Rivers, and which is bounded on the north and south sides by granite. It is unnecessary to enter in detail here into the classification and age of these formations. Of chief importance is the fact that a central body of granite between Gold Lake and Long Lake, has intruded all these formations, sending out quartz veins into porphyry and greenstone, and itself showing quartz veins of the same age. This granite is the latest rock formation in the district, and from it has proceeded not only the quartz, but also the gold and sulphides which the quartz veins contain. It is a feature of rather special interest that quartz veins in this granite, more than a mile from a contact, themselves show very promising gold values at the surface. In this district development has not yet proceeded to any depth. It is rather unusual in districts of similar geological structure to this one that a granite, although the parent body of the gold which occurs in the surrounding rocks, should itself show values in the quartz veins which traverse it.

The Quartz Veins

The veins follow almost without exception the trend of the surrounding rock, which pursues approximately a southeasterly and northwesterly direction. In the originally developed district, that around Rice Lake, the veins were prospected in porphyry and in sediments. In Gold Lake they occur almost entirely in porphyry, while at Long Lake they were originally followed in porphyry, but now in granite and in diabase. The character of the veins varies only very slightly with the variation of the country rock. They follow well defined fissure or shear zones, and may be traced not infrequently for a mile in length. As a rule they are narrow, and the few wide lodes which occur carry low values, if any values at all. This is a feature which has been found not to interfere with the success of some of the camps in Ontario, which give indication of developing into flourishing mining centres, but it renders necessary the continuation of values to very considerable depths before success can be assured. The veins are well mineralized, with sulphides of iron and copper, to a minor extent with sulphides of lead, zinc, molybdenum and arsenic. The highest surface values in gold occur where copper sulphides are well distributed in the quartz, as for example at the Moose Mine, and in the granite veins south of Halfway Lake (Long Lake District.) It is improbable that the sulphides of copper will continue in depth, and it is a matter of first importance to determine whether the gold values will continue with the iron sulphides at deeper levels. It is encouraging to find that the veins are very well defined, easy to follow, and have sharp walls, and more particularly that the mineralization is the result of very pronounced shearing. As the shearing is widespread, there is at least a reasonable promise that the values will continue below surface levels.

Hudson's Bay Company's Buildings at York Factory. Headquarters of District Manager

Natural Resources of Hudson Bay Region

The public mind is gradually beginning to consider Hudson Bay and district from a new viewpoint. It is less than a century ago since the Bay was looked upon as the only gateway to the Great West and North. The Hudson's Bay Company had practically all their posts on its shores and only about that time did they begin to establish trading depots inland, and even then for many years afterwards these inland posts were tributary to those on the Bay. Also it was recognized that there were natural resources in the adjacent country that were of great value, and explorations were made from time to time to investigate and report on these, but as the fur trade furnished such lucrative returns no special effort was made to develop such resources.

Subsequently, the great plains of the West and North were penetrated by traders from the East. Trading headquarters gradually shifted from York Factory to Montreal, and the commerce on the Bay finally resolved itself into the annual supply and delivery ship of the

Sturgeon caught on the Churchill River, above Bloodstone Falls in Manitoba.

Hudson's Bay Company. It thus came about that later generations knew very little about the great Bay of the North and its resources, and came to look upon it as the back door of the country, and a closed one at that, and the region generally a barren, inhospitable, and practically worthless district.

The pendulum is now swinging back. The expansive prairies of the West that were first viewed by the lone pathfinder from the Bay became peopled and prosperous. And as production increased and the inadequacies of transportation facilities came to be a serious handicap, attention was again turned toward the original gateway of the North as a means of relief in providing an additional outlet for the grain and other produce of the prairies. At first the intervening territory was looked upon simply as an obstacle in the way, one to be overcome in the shortest and most expeditious manner possible. Accordingly steps were taken to construct the Hudson Bay Railway, from The Pas to Port Nelson. This enterprise, the completion of which has been long delayed, has been a large factor in directing general attention to the territory through which it passes, and latterly to the Bay itself.

Now comes the statement from those who can speak authoritatively that Hudson Bay is a "national asset," that it has in its waters and on its shores resources of fish, pulpwood, and minerals, and that railway connection only is needed to make these a source of material wealth to the country. Mr. J. W. Tyrrell, in his interesting and instructive work, "Across the Sub-Aretics of Canada," has a chapter on the resources of Hudson Bay, which contains much first-hand information.

Animal Products and Fisheries

Doubtless the most valuable of this class is the Bowhead or Greenland whale, found in the Northern waters of the Bay and Straits. This is an immense animal for the capture of which whalers of the Atlantic coast have directed their expeditions for a century, as it furnishes the valuable whalebone and oil of commerce. One of these mammals will realize from $10,000 to $20,000, and the average value of a whaling cargo in recent years has been about $40,000. Unfortunately these valuable creatures are now much scarcer than they were years ago.

The Beluga or white whale is most prolific. They may be found in great abundance in the estuaries of rivers, particularly the Nelson, Churchill and Hayes. They can be seen there in thousands, disporting themselves in the water—a plunging mass of white. Last summer a number were caught at Port Nelson in special nets made for that purpose by a local sea captain. Those caught averaged about 12 ft. in length and 1,200 lbs. in weight. The oil and hide produets are of considerable value, but at present very little commercial use is made of them.

There are several varieties of seal. The square flipper or big seal is the largest, and the ring seal the smallest. From the former the best grades of leather are produced. The latter is the most numerous species. Its flesh is the main article of diet of the Eskimo. Its skin is useful for clothing, tents and leather, and the oil is also valuable. The harbor, or fresh water seal, unlike others, ascends and frequents fresh water generally. It has an especially fine coat of dark fur.

The walrus is the largest and probably the most important of the seal family, from a commercial standpoint, and is abundant in the Northern waters of the Bay and Straits. It is on these animals that the Eskimo largely depends for existence. Their numbers have been somewhat diminished of late years, mainly on account of the method pursued in hunting them. When killed in the water the walrus, like most other seals, immediately sinks, and thus a very great percentage of those killed are lost. "The harpoon and lance with attached line and float should therefore be the only implement used in the hunt for these animals." It is important, therefore, that the Government should take some action to prevent this indiscriminate slaughter and save this valuable animal from ultimate extinction.

The polar bear is king of the Northern animal world. Equally at home in water and on land, he roams over a wide region. Last summer a large female and cub were killed in the Nelson in front of the harbor works at the Port. In the preceding summer a big male strolled into a railway camp thirty miles from Port Nelson and was killed by a husky "bohunk" with an axe. The main value of this animal lies in its skin, which makes a beautiful robe much sought for. The flesh furnishes good eating for the Eskimo, but is rather too strong in flavor for ordinary consumption.

Of the strictly land animals the musk-ox is the "noblest and most valuable." Mr. Tyrrell states, "it is found in very considerable numbers, and furnishes most luxurious robes." "I have seen musk-ox robes stacked by the Eskimos like hay cocks along the shores of Chesterfield Inlet awaiting an opportunity to market them. In general appearance they may be said to somewhat resemble huge brown horned sheep, but in size and weight they much more resemble the ox."

What the buffalo was to the western plains and the Indian a century ago the Caribou or Reindeer is to the frozen North and its inhabitants. These animals are both gregarious and migratory. In the summer they resort to the open plain or sea coast and in autumn go back to the woodlands or more sheltered districts. They are unsurpassed as an article of food, their flesh being equal to the finest beef and are in especially good condition in September and October. Their skin furnishes material for the celebrated Koola-tang coats of the Eskimo and Indian, providing great warmth with exceptional lightness. Stories are told of the fabulous numbers of some of the bands or herds. Mr. Tyrrell in his book above mentioned quotes an incident as follows: "The next day, after getting into a body of water named Carey Lake, one of the party called attention to something moving on the distant shore to our right. It turned out to be not one, but a band of caribou. Drawing nearer, we found there were not only one band but many great bands, literally covering the country over wide areas. The valleys and hillsides for miles appeared to be a moving mass of caribou. To estimate their numbers

would be impossible. They could only be reckoned in acres or square miles." And regarding other northern animals he says: "Woodland caribou, moose and jumping deer are found in more or less abundance throughout the timbered country about the southern parts of the Bay, so also are black bears, wolves, and colored foxes. Black and red as well as white foxes are also commonly found in the country north of the timber line. I have seen several foxes and about a thousand white ones trapped by a few Eskimos in Hudson Strait during one winter; and I have also seen and handled a single black foxskin which realized for its owner the sum of $1,600. Other fur-bearing animals which may be mentioned as products of the Hudson Bay country are otter, beaver, fisher, mink, martin, ermine, wolverine, lynx and wild cats."

Fisheries

Information regarding fisheries of Hudson Bay is somewhat meagre. The only official investigation that has been made is that of the "Burleigh" expedition in 1914, which was in charge of Mr. N. A. Comeau. The time taken by this was not sufficient to allow a full report

Cabins at Kettle River, Residences of construction officials.

to be made. However, those who have travelled and lived in the North report that the finest of food fish are to be found in abundance in the Bay and rivers emptying into it.

First the salmon, locally known as Arctic salmon; it resembles somewhat the British Columbia variety. It is a fish of very finest quality and flavor. It is caught for local consumption only, for owing to present conditions no effort has yet been made to establish a "fishery."

Sturgeon are abundant in the upper waters of the Nelson River. A fishery has already been established at Sipiwesk Lake, an enlargement of the Nelson, and large quantities are caught there every summer. It is also to be found in the Hayes River and other rivers and lakes tributary to the Bay. This fish is valuable, not only for its flesh, but for the roe or caviar. It varies greatly in size, and runs usually from twenty to one hundred pounds in weight.

Cod and other varieties of deep water fish have been found in these northern waters, and there has been at least one successful cod fishery established. Doubtless many other varieties of deep water fish may be found on investigation.

The following extracts are taken from Mr. Comeau's report:

Whitefish

"This is certainly the most abundant and valuable fish of that region. Early in the spring after the ice has gone out of the rivers they are caught in short nets set along the shores at random, in any place, not only in the rivers and estuaries, but along the coast line as well. This would indicate a migration to the sea. This fishing lasts from the opening of the rivers

until about the end of July, when the fish disappear for a time and commence running again about the end of August and from that on till the fall. These were the dates given to me by the natives, but I found by actual experience that while at the time they were getting no fish at all (Aug. 17) in their shore nets, I could get as much as two barrels in one haul of our small seine. We also fixed floating nets with a short winger at the end, and seldom got less than thirty or forty fish day or night. Later in September the quantity increased considerably. At Seal Creek on the Nelson we got close on to a ton of fish in three hauls of our seine.

"From reports gathered from residents, Hudson's Bay Company's agents and natives, trout migrate to the sea immediately after the opening of the rivers in the spring. The residents claim there are two kinds of trout. One they call salmon trout and the other river trout, basing their distinction on the color of the skin and also of the flesh, one being brightly colored with red spots and the other of a darker appearance and the spots more obscure.

"There appears to be a considerable quantity of pickerel in the Nelson River, some of very fair size up to nine pounds weight, taken in our seine.

"Little or no benefit can be derived for the moment from the fisheries on the western side of Hudson Bay beyond supplying the local demand. They must be developed by local fishermen, and this will only be done profitably when the Hudson Bay Railway is completed. Then I have no doubt they will prove of great value to the Northwestern provinces.

"During the time I was on the Nelson, especially on my last trip in September, we could easily, had we devoted all our time to it, have taken with our short seine from eight hundred to a thousand pounds of fish daily. In one single haul we caught 689 whitefish. On the Hayes River, near Fishing Island, a haul of 100 fish is frequently made. Even at a moderate price this would be quite a lucrative business, provided it could be shipped fresh to market, as will be the case in a year or two. Some experiments that we made in salting a few proved very satisfactory. They were equal to the best quality of herring in richness and more delicate in taste."

Feathered Game

"I have visited and shot over most of the celebrated game resorts of this continent, the north-western states with its famed duck ponds, Lake Champlain in its palmy days, the famous Longe Point and Sorel marshes, Seal reef in the St. Lawrence, and the Labrador shore with its myriads of birds; but never have I seen anything that could compare to this Hudson Bay shore. Geese of various kinds, black and pintail ducks, many species of plovers and the smaller members of this family are to be found there in countless thousands."

Timber and Pulpwood

There is of course no timber for export from the northern part of Hudson Bay region. In the valleys of some of the larger rivers there are valuable belts of spruce which can be used for local needs, but adjacent to the rivers emptying into the southern part of Hudson and James Bays, very large quantities of good milling timber are to be found and the supply of pulpwood is almost unlimited. This, taken in conjunction with water powers readily available, makes an exceedingly valuable asset and one which should be carefully safeguarded and developed by the Government.

Minerals

For two hundred years, minerals, especially copper, have been known to exist north of Churchill River. In 1719 Capt. Knight and associates sailed from England in two small ships, "Albany" and "Discovery," with two objects in view, to locate copper mines about which reports had been received, and to find the ever elusive North-west Passage. This expedition was wrecked off Marble Island, and all were lost.

At a Parliamentary investigation into the conduct of the Hudson's Bay Company held in 1748, various witnesses in the employ of the company who had lived at different places and times on the Bay testified to the existence of copper in the North. One had "seen copper frequently brought down by the Northern Indians. He had seen great quantities of it there." Another stated that he "had seen both copper and copper ore at Prince of Wales Fort and Churchill River which the Northern Indians had informed him they had brought from an

isthmus of land at the farthest extent of their country." And still another said that he "himself carried Mr. Norton, who was afterwards Governor, and two Northern Indians to Churchill, where he put them in a canoe. The purpose of their voyage was to make discoveries and encourage the Indians to come down and trade and bring copper ore." Moses Norton, half-breed son of the above, was subsequently appointed Governor at Churchill, and became so interested in specimens of copper brought down from the North that he took passage in the annual ship to England and laid before the Governors of the Company a project for an expedition to the district from which the copper had come. This resulted in the notable expedition of Samuel Hearne to the Coppermine country.

Sir John Franklin was the next white man to reach the Coppermine, and in his report says: "Our guides reported that they found copper in large pieces in every part of this region for two days walking to the Northwest, and that the Eskimos came hither in search of it." Sir John Richardson, the great naturalist, was a member of Franklin's party, and has given a detailed account of the geological and mineralogical characteristics of the district.

Mr. J. B. Tyrrell, in his pamphlet on the Coppermine country, states that from this description "it would appear that the rocks on the Coppermine River are similar to the copper-

Churchill Harbor.

bearing rocks on Lake Superior, and that the conditions under which the copper occurs are also similar to them under which it occurs on Keewenaw Point, on the south shore of Lake Superior. Speaking broadly, these rocks would appear to indicate a repetition to the north of the great Archean protaxis of the conditions which have prevailed on Lake Superior to the south of it." And from this and other evidence, as well as certain personal investigations, Mr. Tyrrell has come to the general conclusion that "the existence of a great copper-bearing area on the Arctic coast of America near the Coppermine River is certain, and that it is also reasonably certain that that area is very much more extensive than the copper-bearing area south of Lake Superior, extending as it does from Victoria Land and the hills west of the Coppermine River to the shores of Bathurst Inlet far to the east, but whether native copper will be found anywhere as plentifully distributed or in such rich segregations as on Keewenaw Point is yet quite uncertain. As the copper-bearing area in Northern Canada is larger, it is quite possible that the mineral deposits may be similarly larger, and it is worth while for the Canadian people to find out whether they have in this far Northern country a great reserve of copper ore for the use of themselves and the world when the mines that are now being worked shall become depleted."

Iron ores are known to occur in several places, particularly on the east coast and islands along the Bay. Galena exists in workable quantities, also on the east coast at a couple of points, and there is graphite on Ungava Bay. It is reported that gold, silver and molybdenum have been found. There is a large deposit of mica on Chesterfield Inlet. Marble and building stone are available in large quantities. No prospecting of any kind has been done in the

neighborhood of the Bay, but mineral indications are there, and it is confidently expected that important discoveries and developments will follow the providing of reasonable transportation facilities.

The Pas, November 1st, 1918.

Since the above was written there appeared in the Winnipeg *Free Press*, in its issue of November 25th, 1918, an account of an interview with Captain H. T. Munn, Arctic explorer, who had just returned after many years of exploration work in Hudson Bay and Arctic regions. The interview is in part as follows:

"The explorer is characteristically reserved about his mining knowledge, but tells of Eskimos, little dark men who regard white men as something of gods, and who obey the white man's commands. He tells of great Arctic rivers, roaring cataracts in Summer, and dry, ice-bound crevices in Winter."

Hudson Bay Fisheries

He tells of salmon that "run" in innumerable schools, and he prophesies that the day is coming when Winnipeg, through the shortened Hudson Bay railway, will be the centre for a vast northern salmon industry from that country.

Hudson Bay, ice-locked through the greater part of the year, he sees as the home of unborn races of hardy and indigenous fishermen, whose trawlers shall supply the central Canadian Provinces with fish, furs and blubber, that make them manufacturing centres of all those utilitarian products and expensive baubles of civilization which are now made in London, Paris and New York. The parent trawler of this great fleet is not yet afloat on the icy waters of Hudson Bay, but it is coming. Its cousins are already off the coasts of Greenland, netting halibut that are the finest, largest and best flavored in the world.

With the immense salmon fishery grounds of Southampton Island, within forty hours of Winnipeg by rail, Capt. Munn visions the day when this city's fisheries will compete with the Pacific coast. He thinks this will be the greatest advantage obtainable from the building of the Hudson Bay railway.

Scene on Lake Athapapuskow (Top) *Evening (Bottom)*

Some Resources of Northern Manitoba

Extracts from Speech of J. A. Campbell, M.P. (Nelson) in House of Commons, May 7, 1918

There is another way of providing for the tremendous debt that the country will have incurred for war purposes, and that is by creating as much wealth in the country as we can, and there is no way whereby so much wealth can be created with so little effort as by giving proper attention to our vast natural resources. With the exception of the three prairie provinces, Alberta, Saskatchewan and Manitoba, these natural resources belong to the provinces themselves. In the three provinces which I have mentioned, however, they belong to the Dominion. Vast resources have not yet been alienated from the Crown; possibly they were not known to exist hitherto, or the situation might not be as it is. Developments have taken place within the last few years which show that immense resources exist in the northern parts of these provinces which hitherto have not been dreamed of. These prairie provinces have been looked upon as great wheat producing areas, solely devoted to the raising of grains and cattle. But a comparatively small proportion of the great areas of these provinces

Two Acres of Potatoes, Nelson House.

is really known as wheat producing land, and of this only a very small percentage is actually used in the raising of grain and cattle.

Hudson Bay Railway

Some years ago a scheme was devised for the marketing of the increasing crops of grain of the prairie provinces in a more expeditious and less expensive manner. The idea was to build a railway from the wheat fields to Hudson Bay. It is not within the purview of my remarks to discuss at all the Hudson Bay Railway. I do not need to argue the adviasbility of the construction of such a railroad on the grounds mentioned, because I know of no national enterprise that has had behind it such unanimity of opinion on the part of the people as the construction of this road. Both great political parties are pledged to its construction. Both of them had this programme in their platforms. The right hon. gentlemen who now lead the respective sides of this House have both spoken in favor of the project, and addresses along the same lines were delivered by Sir Charles Tupper. When Saskatchewan and Alberta were formed into provniees, the platforms of both parties in the first elections in those provinces contained provisions to the effect that it was necessary, in the interests of the country, and particularly in the interests of the West, that this road should be built. If there is any question regarding the attitude of the people of the West as a whole in the matter of tariff reform, in the matter of reducing the duty on agricultural implements or eliminating it altogether—and I am satisfied there is not—there is absolutely no question in the minds of

the people of the West; they are emphatically and entirely united as to the advisability of constructing the Hudson Bay Railway.

And now we find that conditions have materially changed during the last few years, and that there are other arguments, probably of more importance than those already advanced, for the construction and early completion of that railway. It is well known that there are in Hudson Bay district resources of great value—in particular, minerals of various kinds, and fish. The construction of the railway will, therefore, give Canada another ocean port, and will bring to the people, particularly to the people of the West, the benefit of the immense resources which lie in and around the shores of Hudson Bay. The most important feature in this connection is the fact that we now know that in the northern parts of the western provinces, and particularly in Manitoba, in which more results have been brought to light within the last few years, and in which, by the way, lies the whole extent of the Hudson Bay Railway, resources of great importance have been shown to exist. Up to that time that northern territory was looked upon as a vast waste of rock, forest, water and muskeg. The railway was simply considered as a bridge between the wheat fields of these provinces and

Hay Land adjoining The Pas (Top) *Moose Creek, an immense Hay District (Bottom)*

Hudson Bay, and regret was expressed that the intervening distance was so great, because there would be no local traffic therein whereby the railway could earn any revenue. In the minds of the people, the only industry in that country was the fur trade. The fur trade is still very important, producing a yearly revenue of over a million dollars in that district alone, but it is the least important of the resources to be found in that particular stretch of territory.

Agricultural Possibilities

People tell me that there are no agricultural possibilities in that northern country. There is a general opinion that land that is not of agricultural value, that territory that does not produce crops of grain or raise stock, is of no particular use. I do not for a moment admit that there are no agricultural possibilities, but I want to emphasize the fact that these are not the only important resources; that there are other resources that are worthy of taking a place beside those of an agricultural nature. But in that northern country there are great areas which are suitable for farming purposes of different kinds. It is true that there has not been definite exploration and investigation of the agricultural possibilities of that northern country, but explorers have been there at different times, missionaries have lived there, surveyors and other men have been sent out by the Dominion Government, and there are settlers in different parts of the country. I have here a number of opinions regarding the agricultural possibilities of that stretch of country, but I shall just quote a few of them. I shall start off with a quotation from an article by Mr. J. B. Tyrell, than whom, perhaps, there is no one more cognizant

of the situation in the northern country. Mr. Tyrell has made many trips of exploration throughout that territory, and he has, during the past twenty or twenty-five years, paid considerable attention to it. He says:

"Incidentally we determined the existence of an extensive area of rich alluvial land in the valley of Grass River and its vicinity."

This is in the neighborhood of a mineral deposit about a hundred miles north of The Pas:

"For a hundred miles north of The Pas the country is almost level, and the soil is often quite thin, being underlain by flat-lying beds of limestone. Thence onward almost to the end

Starting over Hudson's Bay Company's tram line around Grand Rapids. Saskatchewan River.

of the track the land is generally rolling, and sparsely wooded with spruce and poplar. The underlying rock is chiefly granite, but it is usually covered with a considerable thickness, perhaps thirty feet or more, of beautifully stratified clay which looks as if it would yield abundant crops to the farmer if it were properly cultivated. Very few cuttings on the railroad go down into the granite rock, but there are a number which show beautiful sections of this rich stratified soil."

Mr. Dickson, of the Department of the Interior, who made a special trip of exploration and investigation into that territory, has this to say:

Sturgeon Fishery on Sipiwesk Lake

"From 50 to 75 per cent. thereof is arable land, and probably has a good agricultural future. I estimate the area of that portion included from north to south, between Wintering and Cross lakes, and from east to west, between Setting and Sipiwesk lakes, at 2,000 square miles. The soil is exactly similar to that around Cochrane, in New Ontario, which yields such large returns under right treatment. On well-drained spots, as far north as Split Lake, the flora is almost identical with that of similar sites in Riding mountains of Manitoba, proving that during the growing season these localities lie under one and the same isotherm, or nearly so. And yet Riding mountains are nearly 400 miles south-west of Split Lake. Two other factors which help vegetation in this northern clay belt are the low absolute elevation—only 500 to 700 feet, and the large proportion of sunlight during the growing season."

I have travelled over that northern country extensively, and while I have not gone far back from the railway, except along the watercourses, I can confirm the statements made in the extracts I have read. For a distance of over a hundred miles along the Hudson Bay Railway north of The Pas from about Mile 125 to the crossing of the Nelson River, at Mile 240, there is a territory which compares favorably with the scrub land of the southern portion of Manitoba. The soil is a rich clay loam, with sub-soil of different kinds, and is capable of growing satisfactory crops.

At this time I would not advocate the growing of wheat crops in that northern country; I think these can now be grown to better advantage in the southern portion of the province. But I would advocate the raising of the coarser grains, cattle, roots and vegetables. In some places cattle can stay out all winter. Of course, there is a great diversity of conditions throughout that vast district; some places would be quite suitable for raising cattle, while others in the same latitude would not be suitable at all, but on the whole, cattle and the crops I have mentioned can be produced satisfactorily. I might further quote from the Rev. John Semmens, who is well known in the West, and has spent several years as a missionary in the

White Whale and Young, Port Nelson.

North. He has lived in that country year after year, and is therefore in a position to say definitely what are the possibilities for that country. He says:

"There are found large areas of open country and valleys of tributary rivers, where the soil is rich and deep and there grazing and stock raising could be very successfully carried on. The sheltering forests and the abundant water sources and numerous beaver dams, and the rich native grasses, would indeed make this locality ideal to sheep raisers and general ranchmen. The absence of anything like a market has hitherto kept this country from being reported of, but if a railway becomes an actual fact, Manitoba will add very much to her available resources when extension comes, and settlers will find that in soil, in wood, in grasses and in waters, this unknown land will afford comfortable homes for thousands."

Timber and Pulpwood

I might here touch on some of the other resources of that country. First, take timber and pulpwood. There are immense possibilities in that country for the extension of this industry. As to merchantable timber, there is a mill at The Pas with a capacity of one hundred thousand feet per day of ten hours, or of two hundred thousand when two shifts are working. If it were not for the scarcity of labor, this mill would double its capacity, but as conditions are, that will

have to be a later development. The timber around there is practically all spruce, and runs from eight to twenty-four inches in diameter. I am not prepared to say how much of this kind of timber can be found north of the Saskatchewan River, only somewhat cursory examinations have been made, but there are at any rate areas of merchantable timber sufficient for the needs of the settlers and development work in that district. Timber, of course, is a commodity which comes in very useful in the development of other resources. There are, however, extensive areas of timber valuable for pulpwood, and these demand careful investigation. I am satisfied that before long there will be mills up in that north country rivalling those in the East. It is to be noted that tributary to these areas may be found, as a rule, water-powers of considerable magnitude.

Fisheries

With regard to fish, the cold waters of the northern lakes turn out a product which is second to none in this country, the main varieties being sturgeon, whitefish, trout, pike, pickerel and several others. Over eighty cars of fish from this northern district were shipped from The Pas this last winter. This is the first time commercial fishing has been attempted in that country to any extent and the quantity would have been considerably more if it had not been for exceptional conditions affecting the fishing at the beginning of the season.

I have sketched in a brief manner some of the existing conditions and possibilities of the great northern hinterland of the three prairie provinces, and I would express the hope that the Government will give to the development of the vast resources indicated their very earnest attention and consideration so that the greatest and best results may be obtained therefrom for the people of this country.

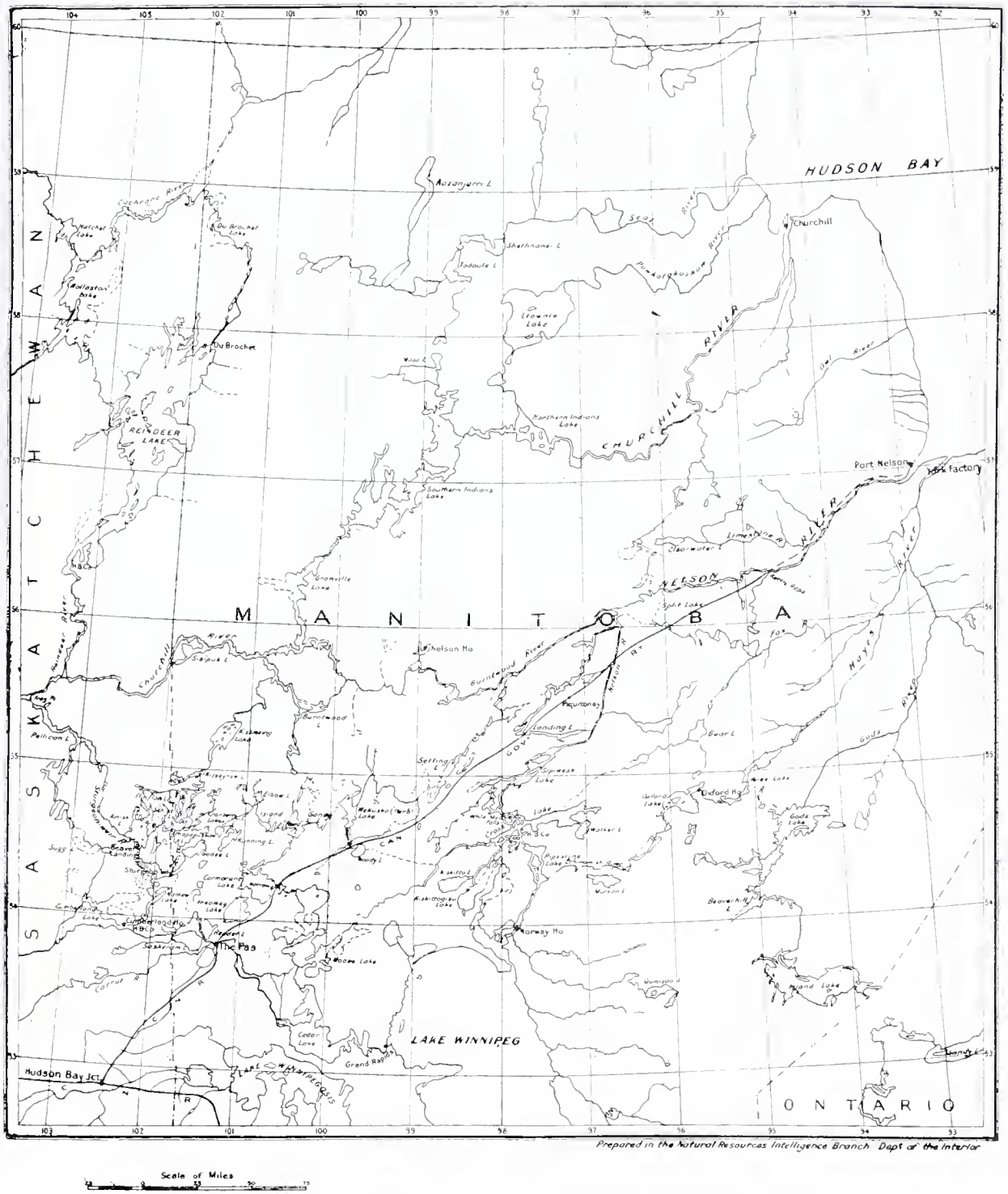
At Finger Lumber Co.'s Logging Camp, Carrot River. Logs for the Mill at The Pas.

The Significance of Manitoba's Northland

From "The Resources of Manitoba and Their Development," by Dr. R. C. Wallace, Prof. of Geology and Mineralogy, University of Manitoba

When, in 1912, the Province acquired an additional area of some 178,000 square miles thus increasing the extent of its territory to more than three times its former area, it assumed a responsibility commensurate with the territorial expansion. The increase in population was relatively small—8911 in the census of 1916—of which some 4000 are native Indians, and a considerable proportion of the white population was engaged in constructional work on the Hudson Bay Railway and docks. The natural resources remained, as before, under the control of the Federal authorities. It might seem that the only practical change was a realignment of the boundaries of the territory, to be known as Manitoba. In actual fact, however, the significance of the realignment of territorial boundaries was far-reaching. A railway line to the sea will now lie in all-Manitoba territory. The importance of this much-discussed railway is far greater, for the Province and for the West, than certain eastern financial interests would freely admit. For northern Saskatchewan and northern Alberta its significance will depend on the amount of grain which will be carried to the port on the Bay, en route for the European markets; and it may be remarked in passing that one is forced to the conclusion, after an examination of all that has been written about the navigability of the Hudson Bay Straits, that such difficulties as have been referred to by the navigators have been magnified in certain quarters, and that the value of wireless communication and other aids to safe navigation have sometimes not been given due weight. Only a relatively small section of our Province will participate directly in the traffic in grain along the new route. The value of the railway as far as Manitoba is concerned, lies rather in the fact that a large area, directly tributary to the railway, is opened up to communication; and the resources hitherto dormant, because of their inaccessibility, will become feeders of industries as the population increases, and as capital for investment in our raw materials becomes more readily available. Not only is the railway belt itself brought within reach of communication, but the waters of the Bay and the west coast, as far north as Chesterfield Inlet, become directly accessible as well. On the section of the railway thus far constructed, transportation has been limited and freight charges high; yet the stimulus to the fishing industry, to prospecting, and to actual mining, has already been very real. From every point of view, it is imperative that the construction of the railway be pushed to a conclusion as soon as the financial conditions of the country will permit.

There has been a tendency, natural, perhaps, but none the less regrettable, to emphasize the mere extent of the territory of Northern Manitoba. Broad acres in themselves, while they may add to our dignity as a Province, demand the expenditures necessary to maintain that dignity in good standing. Were there no actual resources in the northern area, or were the resources in that territory permitted to lie dormant, Manitoba would unquestionably have been richer in the long run had it remained in the humble position of the postage stamp Province. The value of the north-land is in part being substantiated. The expectations are already high. It will be more and more necessary, as development proceeds, that a sympathetic and intelligent interest be maintained in the welfare of the northern hinterland. This is all the more needed because the personal touch is limited. The main routes of travel lie east and west. Too few spend their vacations in the north country, albeit the pleasure and satisfaction to be derived from such a holiday is very real; for the romance that once was of the whole West is now of the north alone. There is a danger, to modify the words of the poet, that "North is north, and south is south, and never the twain shall meet." There are two fundamental facts, however, that one may with a measure of confidence believe will not be lost sight of by the people of this Province. The one is that, in order to round off the industrial life of the community, new resources must be tapped, and to such resources the north-land in all probability holds the key. The other is that only with the intelligent co-operation of all the people can be initiated the enterprises necessary for the successful development of such resources.



NORTHERN MANITOBA.

Fur Sale at The Pas. Photo by J. Coan

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Map of Northern Manitoba Mineral Belt.
Tributary to The Pas Man.
Geological Survey.
Department of Mines.
Ottawa.
Surveys by E.L. Bruce - F.J. Alcock 1914-1915-1916-1917-18.
Scale — 1 inch = 6½ miles
Sturgeon L.
Sturgeon Landing
Stanley Lake
Athapapuskow L.
Copper L.
Copper L. Camp
Claims
Clarke L.
Little Herb L.
Little Herb L. Camp
Herb L.
Wekusko L.
Wekusko Lake Camp
Flin Flon
Mile Lake
Island
Lake
Creek
Bay
Point
Portage
Trail
Mining Division
Approximate Boundary between Manitoba and Saskatchewan